NATIONAL PETROLEUM NEWS

1929 Profits Hinge on Industry's Success In Holding Back Production

NEW YORK, Oct. 13

FOR several years to come, stability within our industry, and its operation with a normal range of profits, will hinge on its success in applying practical conservation measures and thus avoiding overproduction of crude.

Valentin R. Garfias, manager of the foreign oil department of Henry L. Doherty & Co., makes this conclusion in his annual report, estimating world petroleum production for the current year.

His estimates, made for several years past, have been very close to the actual figures as to production in the United States and other countries, which, of course, are not available until some weeks after the close of the year.

"The most important development during 1928 has been the partially successful attempts at normalization of production, which is another name for conservation," said Mr. Garfias.

"In the United States output has remained practically stationary in the face of an available supply almost double the actual production of the fields. . . .

"This uniformity in production is due primarily to the curtailment of output from wells already drilled, it being estimated that the available or shut in production at the end of the year was close to 500,000 barrels per day, which is equivalent to the combined production of Venezuela and Russia, the second and third ranking countries."

Mr. Garfias pointed out, however, that large available supplies of oil above and below ground are necessary to safeguard increasing consumption, citing that domestic consumption and exports of gasoline from the United States in 1928 will be close to 36,000,000 barrels—over a billion and a half gallons." Obviously, still stronger factors of safety in the way of available crude supplies must be arranged in order to continue meeting the rapidly expanding consumption," said Mr. Garfias.

The United States is and should remain the dominant factor in the effort to apply intelligent and effective conservation to petroleum resources, Mr. Garfias continued.

"It is urgent to establish in this country as soon as practicable effective machinery that will eliminate a repetition of concentrated over-production, with its accompanying inevitable waste," he said. "That something has already been accomplished along this line can be seen by the conservation measures adopted in the Oklahoma and Texas fields. Also, it is fore-

THE Special Engineering section begins on page 65 with articles pertaining to refining. Production engineering articles start on page 141 and special marketing articles begin on page 175.

World Petroleum Production in 1928

(In thousands of bbls.)

The following table shows world production in 1926, 1927 and 1928. Figures for the first two years were furnished by the U. S. Bureau of Mines, while the 1928 figures are the estimates of Valentin R. Garfias, manager of the foreign oil department of Henry L. Doherty & Co.

Country	1926	1927	1928
United States	770,874	901,129	890,000
Venezuela	37,226	64,400	105,000
Russia	64,311	72,400	80,000
Mexico	90,421	64,121	47,000
Persia	35,842	36,800	37,300
Roumania	23,314	26,100	28,000
Dutch East Indies	21,242	21,400	21,500
Colombia	6,444	14,600	20,000
Peru	10,762	9,800	10,500
Argentina	7,952	8,700	8,800
India	8,728	8,200	8,000
Trinidad	5,278	5,200	6,200
Poland	5,844	5,800	5,600
Sarawak	4,942	5,000	5,200
Japan	1,900	1,700	1,700
Egypt	1,188	1,270	1,300
Germany	653	700	720
Ecuador	214	450	700
Canada	364	500	600
France	478	525	540
Sakhalin	181	200	220
Czechoslovakia	150	140	140
Others	81	260	200
	1,098,389	1,249,395	1,279,220

VALENTIN R. GARFIAS
Manager foreign oil department, Henry L. Doherty & Co.

shadowed that the next move will be the concerted action of the largest companies throughout the world to accomplish a similar objective.

"A conference of American producers is being planned at which it is expected that adequate measures will be adopted, and assurances are expected from foreign oil executives that their companies will cooperate in a program to conserve resources not only in America, but in Venezuela and Mexico.

"All this tends to show a unanimity of view that uneconomic production of crude oil has been increasingly injurious to the entire petroleum industry, and in the end would adversely affect the consumer. A clear understanding has been reached on the part of all concerned as to the desirability of regulating the world's petroleum output to conform more closely to the requirements of the present and future consuming markets.

"The petroleum industry, profiting by past experience and costly mistakes, appears to be at last on the road to sound economic stability."

World production for 1928, Mr. Garfias estimates at 1,279,220,000 barrels, an increase of 29,825,000 barrels, or about 2.3 per cent, as compared with an increase of over 133,000,000 barrels the previous year.

Daily average world production was close to 3,500,000 barrels, the fields on the American continent producing close to 85 per cent of the total, as in the previous year.

"The United States production, which in 1927 increased over 15 per cent from the previous year, should remain practically stationary or slightly decrease in 1928, the total being estimated at 890,000,000 barrels, or 69.6 per cent of the world's output," he said.

"The Venezuelan production, estimated at 105,000,000 barrels, or an increase of 40,000,000 barrels over the preceding year, is equivalent to 8¼ per cent of the world's total and places this country second in rank, a position that it should easily maintain for years to come.

"The output could have been considerably larger had not the oversupply in the United States made it advisable for Venezuelan operators to enter into tentative conservation agreements. The Venezuelan oil under competitive development has displaced the higher priced products from other countries with the resulting unbalancing of the price structure, in the same way that the Mexican flush production of 1921 disrupted the industry at that time.

"Russian production is estimated at 80,000,000 barrels, an increase of 8,000,000 barrels from the previous year and representing close to 6¼ per cent of the world's total. During 1928, difficulties between American and English oil companies arose as to the marketing of Russian products. These difficulties are on the road to amicable settlement.

"The Mexican production in 1928 is estimated at 47,000,000 or close to one-half of that of 1926. This condition has been brought about by the gradual decline of production of the old fields without the compensating effect of new development, it being expected that if the present trend continues, Persia will out-rank Mexico during 1929 as the fourth producer. Considerable progress was made in the settlement of pending matters relating to petroleum legislation, and the expected peaceful solution of the complicated political situation brought about by the assassination of President Obregon bids fair to encourage intensification of future development.

"The fields of Persia and Roumania continued their gradual expansion, the former producing close to 3 per cent and the latter slightly over 2 per cent of the world's total.

"The fields of Dutch East Indies remain practically stationary, with a production around 21,000,000 barrels.

"The production of Colombia increased from about 6,000,000 barrels in 1926 to 14.600.000 in 1927 and 20,000,000 in 1928, the entire output coming from Las Infantas field in the Magdalena Valley, from which the product is transported to the coast by pipeline.

"It is estimated that, if the present trend of production continues, the Colombian fields will outrank those of Dutch East Indies in 1929. During the year, the Colombian Government issued a Provisional or Emergency Petroleum Law containing drastic nationalization clauses. This and other steps so affects existing concessions that it makes additional development, for the time being at least, out of the question."

Attempt to Limit Oklahoma Production Fails

TULSA, Oct. 13

PRORATION in Oklahoma has been abandoned so far as the limit of 700,000 barrels daily, fixed in corporation commission order, is concerned. That order was issued early in September. The advisory committee of operators is asking the commission to retain the order in force, but to make the limit 750,000 barrels.

Thus, the only part of the order now in force is the restriction on shooting. No production is now being prorated. One order, issued prior to that on proration, still holds the Mission pool, in the western part of Twp. 8-6, Seminole county, back from development.

It provides that no drilling besides the wells now under way is to be started before Nov. 15 and that the present producing wells, more than a half dozen of them, are to be held to nominal production until the first producing offset to each is completed.

That there is something of a "break" in the situation in Oklahoma is now quite apparent. Sentiment may be described as bullish in certain quarters and a fair amount of money has been wagered on a crude oil price advance before the first of the year. The optimists assert that every field of major caliber in Oklahoma has passed its peak, predicting that is true for both the St. Louis and the Little River fields. The former pool is experiencing a little more water encroachment each day while Little River's worth while drilling is about at an end.

One of the few remaining spots where some sort of restriction is being practiced was opened Oct. 12. About 10 months ago the Barnsdall Oil Co.'s No. 1 Fife test in 14-8-5, west of the Mission pool, was drilled in. It showed for a sizable well, probably 1500 barrels, and was shut in. It has been produced for small quantities since that time, but for the greater part of the time has been entirely closed in. Barnsdall retained discovery rights, as offset operators had not contributed to the drilling expense on the "dry hole money" plan common in this district. Hence, when Sinclair Oil & Gas Co. started this week to drill a diagonal offset northeast, Barnsdall opened to production.

The opening of this pool at this time was another of those unhappy royalty situations. The Sinclair company has had several weeks of discussion with a royalty owner under its tract and attempted to keep from drilling. The company offered to pay back royalties, based on what the Barnsdall well had produced, but the royalty owner would not accept and threatened suit to cancel the lease. Other wells will be started immediately by Barnsdall and by Gypsy Oil Co.

The Mission pool is still held in check and the committee is now working on a plan of spacing the wells that will start Nov. 15.

The "break" in the situation, more sensed than apparent, will not lead to any big drilling campaign this winter, either in old fields where undrilled locations exist or in wildcat territory. Wildcatting from now on promises to be an entirely different thing than before the days of Seminole.

The professional wildcatter, who

promoted a well by selling "spreads" in acreage blocks to the large companies, is finding his road little, if any, easier than it was a year ago. The substantial companies large and small, have learned through their Seminole experience, to get together and form their own drilling agreements, pledging themselves to pay to the one that drills the well a substantial part of the well's cost in the event that it is dry.

In that way they test each other's acreage, distributing the losses and as wells thus drilled waive discovery rights—shutting in until the offsets reach the sand, development of any new pool opened can be handled in an orderly and unhurried way. Little River is an outstanding example; it was held back from development for about eight months after the south extension was discovered. The Mission pool has been delayed in development for a year.

That proration will be invoked again if production mounts rapidly this winter because of some unforseen event—such as a big gain in the St. Louis output—is probable. The allowable amount is being raised to a point above the actual production of the state because the pipe lines actually want all the oil that is now being produced. Should it go up to 800,000 barrels, say, this winter, it is likely that the machinery would again be set up.

It was underestimation of the demand for Oklahoma oil that lead to the fixing of the allowed amount at 700,000 barrels. As this order, like all previous ones, rested for its force upon the will of the operators, hence upon the economics of the situation, the corporation commission has not attempted to enforce it.

The commission has always taken the position that it does not understand the oil business as well as those engaged in it and it has been insistent upon its orders being obeyed only where they pertained to waste, such as escape of gas into the air, improper plugging of wells, improper protection of oil sands from water and other matters which clearly came within its jurisdiction as the conservation agency of the state. It has not attempted to interpret supply and demand and it is not doing so in this case.

Santa Fe Springs Peak Estimated at 319,000 Barrels

LOS ANGELES, Oct. 13

THE peak of production at Santa Fe Springs as a result of the development of the deeper Buckbee zone will be 319,000 barrels, daily average and will be reached in January, 1929. This estimate was placed before the Santa Fe Springs conservation committee by a sub-committee composed of six company engineers at the weekly meeting held Oct. 12 in Los Angeles. The estimate further placed the production of this field in June, 1929, at 128,000 barrels and at 76,000 barrels in December, 1929.

As this estimate was made with only one deep zone well on production the engineers were forced to work rather in the dark. For the purpose of the estimate, they assumed: That the initial peak production would be 3000 barrels per well per day. That the average thickness of the Buckbee zone would be 200 feet or more.

That the areal extent of the Buckbee zone would be about the same as the Meyer.

That wells producing in the Buckbee would decline at the same rate as the wells in the Meyer.

That approximately 250 wells will be drilled into the Buckbee sand.

That the average drilling time per well will be 120 days, and that the drilling campaign to the Buckbee will partially mud up or impair the production from the three higher zones during the development program.

The engineers estimated that the daily production of gas from the deeper zone will be reached in February and that there will be a surplus of approximately 274,000,000 cubic feet, which will have to be wasted, if no use for it is found before that time. It is estimated that the daily production of gas at Santa Fe Springs will be 387,000,000 cubic feet in January and will drop to 152,000,000 cubic feet in June, and reach a low production of 52,000,000 cubic feet by December, 1929. The gas estimates were reached as in the case of the estimate on production of oil.

It also developed during the committee meeting that the pipe lines serving the Santa Fe Springs had a total capacity sufficient to take care of a peak as estimated, and provided the peak figure did extend over too long a period. If the peak should reach as high as 400,000 barrels, then the pipe line capacity would have to be slightly augmented.

Although the official statement made public following the meeting did not mention the fact, it is known that none of the major companies feel that there will be any need for building additional steel storage in the state as a result of the big production expected from Santa Fe Springs. Other major companies are in splendid shape with reference to storage space. A few of the smaller operators may have to find storage room.

It was estimated that the daily production of the state will increase from 624,725 barrels in October, 1928, to 922,292 barrels in January, 1929, and decline to 702,545 barrels in June, 1929, and still further decline to 609,475 barrels by December, 1929.

The estimate gives the total possible production of the state at 1,017,805 barrels, daily average, which includes the shut in for January, 1929, and this total declines to 798,058 barrels next June and a further decline to 704,988 barrels in December, 1929. The daily average shut in production as of Oct. 1, 1928, was given at 130,213 barrels, 80,982 barrels of which is heavy oil.

Index to Coming Meetings

Lubrication week of Ohio Petroleum Marketers Association, Oct. 20 to 27.

International Petroleum Exposition, Tulsa, Oct. 20 to 29.

American Association of Petroleum Geologists, Pacific Coast section, Los Angeles, Nov. 1, 2.

California Natural Gasoline Association, Biltmore Hotel, Los Angeles, Nov. 13, 14.

Rocky Mountain Oil & Gas Association, Casper, Wyo., Nov. 14, 15.

Rocky Mountain chapter, A. P. I. division of development and production engineering, Casper, Wyo., Nov. 14, 15.

Independent Oil Men of America, Stevens Hotel, Chicago, Nov. 19, 20 and 21.

Rocky Mountain Oil & Gas Association, Montana chapter, Great Falls, Mont., Nov. 23, 24.

American Petroleum Institute, Stevens Hotel, Chicago, Dec. 4, 5, 6.

Nebraska Independent Oil Men's Association, Municipal Auditorium, Hastings, Neb., Dec. 4, 5, 6.

Wisconsin Petroleum Association, Schroeder Hotel, Milwaukee, Dec. 12.

Wisconsin Petroleum Association: Park Hotel, Madison, Jan. 16 and Feb. 13; Schroeder Hotel, Milwaukee, March 13 and Apr. 10; Beaumont Hotel, Green Bay, May 15.

Ohio Petroleum Marketers Association, Neil House, Columbus, O., Feb. 13, 14, 15.

American Association of Petroleum Geologists, Fort Worth, March 21, 22, 23.

Reduced Rates to Enlarge Marketing Territory of West Texas Refiners

By J. C. Chatfield
N. P. N. STAFF WRITER

TULSA, Oct. 15

WITHIN the next 30 days all refining points in the West Texas group will be granted reductions in freight rates to the western half of Standard of Indiana territory. In addition proportional rates will be established which will give the West Texas group an opportunity to ship into Ohio and the east.

The reductions in rates will range from 2.5 to 4.5 cents per 100 pounds or 0.165 to 0.297 cent per gallon. New rates are those established by the Texas & Pacific railroad which meet the reductions made by the Santa Fe in September from Pecos and other points on that road.

The first reduction will take place on Oct. 20 when proportional rates will be established from Big Spring, Tex., to St. Louis and Chicago. On that date the proportional rate on light oils to St. Louis will be reduced to 31.5 cents per 100 and the heavy oil rate to 25.5 cents per 100. On the same date Big Spring proportional rates to Chicago will be cut to 38.5 cents per 100 and fuel oil to 31.5 cents per 100.

On Oct. 21 new rates will be made from Midland, Monahans, Wickett and Pyote to Kansas City, St. Louis and Chicago and intermediate points. The light oil rate to Kansas City will be cut 3.5 cents per 100 to 33.5 cents and the heavy oil rate will be cut 2.5 cents to 27 cents per 100.

From these same points the light oil rate to St. Louis will be cut 4.5 cents per 100 to 35.5 cents or 5.5 cents over Group 3. The heavy oil rate will be cut 3.5 cents to 28.5 cents per 100, making the differential over Oklahoma 3.5 cents per 100.

Rates from Big Spring to Kansas City will be the same as from Pyote and adjacent points after Oct. 21. To St. Louis the rate will be 1.5 cents per 100 under the rates from the Pyote group, making the big Spring gasoline rate to St. Louis 34 cents, only 4 cents per 100 or 0.264 cent per gallon over Oklahoma.

The reduction in rates from West Texas point to Chicago and points intermediate between St. Louis and Chicago will not become effective until Nov. 12. On that date the rate from Monahans, Wickett, Pyote and Midland will be cut 4.5 cents per 100 to 41.5 cents, a reduction of 5.5 cents per 100. Fuel oil rates from these points will be cut 4 cents to 33 cents per 100 and stand just 4 cents over the Group 3 rate.

At the same time, Big Spring will benefit by a cut of 6 cents per 100 on light oil shipments to Chicago, bringing the rate down to 40 cents per 100. Big Spring will thus have an advantage of 1.5 cents per gallon over the Pyote group on gasoline shipped into the Chicago district. Heavy oil rates from Big Spring will be cut to 32 cents per 100, one cent under Pyote and 3 cents over Oklahoma.

Chicago rates have been blanketed back from that city almost to St. Louis. In the immediate vicinity of St. Louis the rates from the Pyote group will be 1.5 cents lower on gasoline and 1 cent lower on fuel oil.

On Nov. 15 proportional rates from the Pyote group will be established to both St. Louis and Chicago to enable the new refining group to ship into Michigan, Ohio and the east. New proportionals will be 33.5 cents per 100 on gasoline to St. Louis and 27 cents on fuel oil. To Chicago the new proportionals from Pyote and vicinity will be 39.5 on light oils and 31.5 cents per 100 on fuel oils.

The new proportionals will be 6 cents per 100 over Group 3 on gasoline and 4 cents per 100 on fuel oil. Since these differentials will be carried through in the final rate buyers in Michigan, Ohio and the east may ascertain the rate from West Texas to destination by adding 6 cents per 100 to the Group 3 gasoline rate and 4 cents per 100 to the fuel oil rate from Group 3.

None of the railroads serving the new West Texas refining groups has announced rates to destinations in the western half of the Mississippi valley which will permit of movement of refined products in competition with Oklahoma, Kansas and north Texas. The West Texas market to the north will be largely in St. Louis, Chicago and beyond.

On Oct. 25 the carriers will establish new rates to destinations in Indiana. These cuts, however, are quite small as compared with those to St. Louis and Chicago, leaving the differentials over Oklahoma 10 cents per 100 or 0.66 cent per gallon on gasoline and 8 cents per 100 or 24.86 cents per barrel over Oklahoma on fuel oil. Indiana has been divided into five destination groups for purposes of making the new rates from West Texas. The present and proposed rates to Indiana points and the present Oklahoma rates are given in Table 1.

* * *

Rate Investigation Widened

WASHINGTON, Oct. 14.—An enlarged investigation of freight rates on refined products of petroleum, to include among other things, the rates prescribed by the authorities of Texas and Kansas has been announced by the Interstate Commerce Commission. That body has inflated its investigation of oil rates begun under the Hoch-Smith resolution of congress, intended to give the farmers lower freight charges by adding 10 freight rate suits recently filed by oil companies to the older investigation.

New complaints thrown into the already hotly boiling pot of oil rates by this enlargement are those filed by Lone Star Gas Co., Transcontinental Oil Co., Texhoma Oil & Refining Co., Litwood Oil & Supply Co. et al., Oriental Oil Co., Skelly Oil Co., Louisiana Oil Refining Corp., Transcontinental Oil Co., Gulf Refining Co., Anderson Oil Co., Oscar Fuller et al.

Table I

Proposed new rates from Wickett and adjacent West Texas refining centers to Indiana destinations to be effective Oct. 25. Rates in cents per hundred pounds.

Destination Group	Product	Rates From Wickett, Pyote, etc. Oklahoma	Present	Proposed
A	Gasoline	39	50	49
A	Fuel	31	40	39
B	Gasoline	41	52	51
B	Fuel	33	41.5	41
C	Gasoline	43	54	53
C	Fuel	34.5	43	42.5
D	Gasoline	45	56	55
D	Fuel	36	45	44
E	Gasoline	46.5	57.5	56.5
E	Fuel	37	46	45

Explanation of Groups: Group A includes Lafayette, Terre Haute and Vincennes; Group B includes Valparaiso, Indianapolis and Kokomo; Group C includes Muncie and Madison; Group D includes South Bend and Richmond; Group E includes Steubenville and New Haven.

Fight Against Oil Well Fire Still Goes On

Photo, Underwood & Underwood

How engineers attempted to put out the fire which has been burning for more than 3 weeks in the Getty No. 17 well in the Santa Fe Springs, Calif., field. From a hole dug by a steam shovel, left, behind the heat screen, a tunnel 185 feet long was dug to tap the casing. Efforts to put out the fire were to be made by flooding the well with mud and steam. A drawing showing the plan of action proposed was published on page 42 of the Oct. 10 issue of NATIONAL PETROLEUM NEWS

LOS ANGELES, Oct. 13.—It was expected late this week that the Getty burning well at Santa Fe Springs would be history early in the week, as the crew working through a tunnel has already penetrated two outer casings and is preparing to pierce the last string and pump in mud to kill the flow. This well lost circulation for three days and while the tools were being pulled from the hole Sept. 15, the well blew out and caught fire.

The tools were left partially in the hole, for a depth of 2700 feet, with the Kelley bent and lying across a highway from the well. The gas and oil caught fire and flames having been leaping into the air from the mouth of the well as well as from the end of the Kelley.

Early this week, J. B. Riley of the Fluid Pack Pump Co., an expert in handling wild wells, directed the work of making a connection with the Kelley so cement and mud could be pumped into the hole. This pumping had continued for more than 48 hours up to the night of Oct. 12 without success.

Work is being continued in the tunnel, which taps the casing about 50 feet underground. A chamber was excavated around the casing, to give room to work. Cement was pumped in between the surface casing and the next string and then the surface casing and stripped away. The 11-inch was penetrated and cement pumped between it and the 9-inch.

At the close of the week, the 9-inch was being penetrated to pump in mud in an effort to kill the flow, as this mud will be helped by the mud being pumped in through the drill pipe. Those working at the well hope to kill the flow early in the week.

The regulating body has also reopened the cases of eight other oil companies. The cases opened up again were brought by The Texas Co., Gibson Oil Co., Cities Service Co., Empire Refineries, Barnsdall Refineries, Inc., et al., Dixie Oil Co. et al., Standard Oil Co. of Louisiana.

Export, import, coastwise and less-than-carload rates have been excluded because decision on the highly refined products usually disposes of questions in relation to the excluded rates.

Hearings have been decided upon at Dallas, Tulsa and Kansas City in the order of their naming, dates to be announced.

Correction

J. P. Sutton, chairman of the lakes division of the petroleum section of the National Safety Council, is with the Ohio Oil Co. at Findlay, O., and not with the Pure Oil Co. as published on page 30 of NATIONAL PETROLEUM NEWS for Oct. 10.

Keokuk Licensing Law Meets Early Death

CLEVELAND, Oct. 15.—The city council of Keokuk, Iowa, repealed before it became effective a licensing ordinance passed June 19, last, which placed heavy tax burdens on bulk and filling stations. NATIONAL PETROLEUM NEWS in its issue of Sept. 12 published an editorial in which this ordinance was condemned as unfair to the oil industry. A copy of of the licensing and taxing ordinance was given NATIONAL PETROLEUM NEWS but the repealing ordinance was not heard of until after the editorial had been published.

The ordinance was repealed through the efforts of Keokuk gasoline distributors and dealers and the Keokuk Chamber of Commerce.

Frank. J. Weber, president of the Keokuk chamber, has written NATIONAL PETROLEUM NEWS, in part:

"The day following the publication (as a legal advertisement) of this ordinance a number of the filling station owners objected to the passage of same and filed complaints. The Chamber of Commerce did not get into it until several days after the filling stations had called upon the city commission."

The passage of the first ordinance received the unanimous support of the city's three commissioners. So did the repealing ordinance which was passed as an emergency measure the day before the licensing measure would have become law.

More and More Gasoline Needed Till Each Member of Family Has a Car

By Ward K. Halbert
N. P. N. STAFF WRITER

DETROIT, Oct. 11

GASOLINE and motor oil will be in gradually increasing demand until every adult member of every American family who can afford it has a car and there is a spare car as well in the family garage.

Until that time comes, R. H. Grant, vice president and general sales manager of the Chevrolet Motor Co., told the jobbers assembled at the convention of the American Oil Men's Association in Detroit Oct. 11, we need not worry about saturation of the motor car market which would mean a static condition in the market for gasoline and oil.

Mr. Grant's subject was "Salesmanship" and he discussed the sales problems of the oil marketer so familiarly that some of them were surprised to learn that Mr. Grant has no financial interest or managerial concern in the oil business.

Although his hopes are sanguine with regard to the continued, gradual increase in automobile registration from year to year, he does not think the oil men will be rushed to serve them. "It is obvious to the motorist," he says, "that competition is keen in the retail end of the oil industry," and he predicts that the number of retail outlets will soon begin to grow fewer. In discussing the oil man's sales problem, Mr. Grant said:

"Gasoline and motor oil already are seven-eighths sold. The customer does not have to be impressed with his need for the merchandise. Already he knows he has to have it. There are no complicated mechanisms to introduce to the trade. Already the motorist knows what gasoline and oil are for. It is largely a matter of knowing how the public wants to be treated and supplying its members with that treatment to hold their consistent patronage.

"If the proprietor of the company does not have any ideas on salesmanship, he need not expect his men to have. Salesmen are not born, they are developed. You can give them any quantity of sales manuals and books on salesmanship, but it will do no good unless the proprietor is willing to study them and teach them to his men. Salesmen are like batteries. They get run down and exhausted by their contacts with the public and they have to be called in and re-charged once in a while, otherwise their plates buckle and they go dead. If you are not a salesman yourself and not capable of re-charging your men, hire somebody who can do it for you.

"Consider the symphony orchestra," Mr. Grant suggested. "You never hear those musicians except at their best. When they are practicing they do not sound nearly so good. They never permit the public to hear them practice. But do you give your salesmen a chance to practice? Most business men let them go right out and practice on the public. No wonder the public's impression of service station salesmanship is bad."

In suggesting that service station salesmen be given a chance to practice, Mr. Grant was making a point in favor of sales practice schools where the men learn the management's way of selling from the management itself and a place where salesmen may actually rehearse their parts and be coached in the art of retail selling.

Talking about the airplane, Mr. Grant predicted that it would be a stimulant to automobile sales. He does not consider that the plane ever will be a family convenience like the automobile. Most of us will never own large landing fields and employ mechanics to keep our planes in trim, he thinks, but considers the plane more a competitor of railroad transportation. "For every big plane in the air there will have to be two automobiles on the ground to take the passengers from town to the field and from the field to town," he says.

Mr. Grant was the headline speaker of the convention. Secretary James A. Gilmore of the A.O.M.A. experienced the worst of luck with regard to his program. Three of the main speakers were unable to appear. W. B. Stout of the Stout Air Services, Inc., Detroit, was called to Europe unexpectedly the day before the meeting started. C. F. Kettering of General Motors Research Laboratories became seriously ill the day before he was to address the oil men. And Harvey Campbell of the Detroit Board of Commerce was sent to jail on the morning he was scheduled to appear, there to serve a 2-weeks sentence for contempt of court.

The registration exceeded 300 and more than half the men at the meeting were bona fide oil jobbers. All the available exhibit space was sold and the equipment men got a satisfactory "run for their money" because it was impossible for any man at the meeting to reach the meeting hall or the lunch room without walking by every equipment exhibit.

The second inspirational talker of the convention was W. J. Gerwe of Vacuum Oil Co., whose job it was to present the association's new educational plan for service station men. Three of the six proposed textbooks in a retail salesmanship course were on exhibit at the meeting. Several oil men subscribed to the course for their employes. Mr. Gerwe expressed the need of training for retail salesmen by telling how certain jobbers have improved their sales and profits by a definitely prescribed course of training for their salesmen. For a detailed account of Mr. Gerwe's address, see page 69 of NATIONAL PETROLEUM NEWS, issued May 2, 1928.

Considerable interest was manifested in the four special services A.O.M.A. has developed in the last year for jobbers. Besides the educational service which Mr. Gerwe presented, the Rogers-Gano advertising agency of Chicago is working out an agency "copy service" for Independent jobbers, and Pierce & Granata, certified public accountants, are presenting a standardized accounting system for Independent jobbers through the association.

Mr. Gilmore discussed the house organ for jobbers which the association is publishing, and distributed copies through the audience. He related that it is now being used by 111 different companies which, all together, are buying 7700 copies of the magazine a month. It is called "The Service Station Salesman."

In talking about a code of standardized marketing practices which a committee of the association has drafted, Mr. Gilmore pronounced the key-note of the meeting, although the key-note address lasted only a few minutes, he said:

"There are a lot of people who laugh when they hear anybody mention a code of ethics (call it anything you like) for the petroleum industry. But those same men would have laughed two years ago had anybody told them that some day crude production would be controlled successfully by a force emanating from within the industry itself.

"Now if the producers can solve their troubles: and if the refiners can solve their troubles, the marketers can solve their troubles too. I can confidently assure you a code of sound practices before the American Petroleum Institute's committee quits its task, and assure you moreover that it will tell about the only way an oil man can do business and prosper."

Jobbers Used to Selling Collectively, Together Buy Fifty Station Buildings

By Ward K. Halbert
N. P. N. STAFF WRITER

L. V. WHITE

DETROIT, Oct. 11

SHOWING the extent to which a group of Independent jobbers may prosper and expand their business through a program of collective marketing, it became known this week that the distributors of "Dixie Gas" recently placed an order for 50 metal service station buildings, all uniform and uniformly equipped. They also employed a professional field representative and closed a contract with an advertising counselor.

Dixie Distributors Inc., of Michigan and Wisconsin held their autumn meeting at the Statler hotel, Detroit, Oct. 9, 10 and 11, coincidentally with the convention of the American Oil Men's association. They held one open session at which all the oil jobbers at the national convention were given a chance to learn how the collective marketing program works.

The new field representative is John E. Boersig who was special representative of Vacuum Oil Co. in Michigan at the time he was employed to give his whole time to Dixie Distributors Inc., and E. T. Sadler of Chicago is the new advertising director.

For working purposes, Dixie Distributors Inc., are divided into two groups, one in Michigan (the original organization) and one in Wisconsin which is less than a year old. The Michigan organization is headed by L. V. White of the L. V. White Oil Co., Kalamazoo. J. J. Theisen of the Theisen-Clemens Co., St. Joseph, is vice-president, and P. R. Kempf of Staebler Oil Co., Ann Arbor, is secretary-treasurer. There are 18 member companies in Michigan.

The Wisconsin organization has for its president, E. Bert Rentmeester of the Oconomowoc Oil Co., Oconomowoc. Gray Czeskleba of Waupaca is vice-president and Samuel D. Hastings Jr., Barkhausen Oil Co., Green Bay, is secretary-treasurer. It has 21 member companies. The newly acquired field man and advertising director are employed by the parent company which includes both state organizations and will include whatever extensions the corporation may make.

L. V. White, founder of the movement, says that groups of oil men in Ohio, Indiana, Illinois and Iowa already are making strong bids for the establishment of Dixie organizations in their states and are preparing to put "Dixie Gas—the Power to Pass" in every sizable town in the middle west.

During the open meeting of the Dixie group, Mr. Hastings of Green Bay told the gathering that the 21 companies were marketing a total of 1,700,000 gallons of Dixie Gas a month in Wisconsin. He related that when the Wisconsin jobbers organized they contracted with the Michigan group to spend at least $10,000 a year for five years on advertising, but reported that they had spent $16,000 for advertising already in a little more than five months.

Mr. Theisen made the first address of the Dixie meeting and told something of the tiresome work of organizing and building the institution to its present strength. He expressed regret that a number of good oil jobbers in Michigan, desirable as members for the organization were excluded by the rule of exclusive territories. "We already have a member in their territory and for that reason they cannot come in," he said. "However, there are some other organizations of a similar nature, and my earnest suggestion to them is to join one of them. If an Independent wants to survive he should fortify himself."

Frank Lovejoy, Vacuum Oil Co., New York, was the headline speaker for the Dixie Distributors. He started his address by telling them that their proposition was the soundest cooperative movement of a local character he knew about, and offered them some suggestions from his extensive observation of the marketing business.

Mr. Lovejoy's first suggestion was

How It Began

Dixie Distributors Inc., embraces 18 Independent jobbers in Michigan and 21 in Wisconsin. They advertise "Dixie Gas—The Power to Pass," use the same trade marks, maintain the same specifications and follow a standardized service system at sales stations.

It originated with L. V. White of Kalamazoo who composed the slogan himself and used it alone for several years. Other jobbers wanted it and he let them use it in certain specified territories. From there it has grown without any flamboyant promotion.

Today Dixie Distributors Inc., is a sizable corporation with several subsidiary organizations. Its members buy collectively to whatever extent is mutually profitable but no member is obligated to buy through the organization. It is financed by a few mills per gallon of Dixie gasoline sold.

to bring their motor oils to S. A. E. viscosity standards as quickly as possible, get the numbers put on the packages and pumps and in this way get in step with the leading thought in the industry. He pointed out that 50 refiners already have begun the use of S. A. E. viscosity numbers.

Mr. Lovejoy's second suggestion was to confine the activities of the Dixie movement to five states. He mentioned a number of notable mistakes on the part of ambitious distributors who attempted to make the whole continent their market at once and failed utterly.

His third suggestion was to cater to women. "Aside from all the driving and shopping at the service station done by women with their husbands' cars," Mr. Lovejoy said, "There are 1,486,000 automobiles in this country owned in women's names." One good way to start catering to women is to provide wide driveways at filling stations, so inexperienced drivers can navigate them with ease. "Nothing will make a woman drive by a station so surely as a difficult looking approach," he said.

The speaker's last two admonitions were to maintain standards, uniform and good, in the selection of merchandise to sell, and to become primarily buyers for rather than sellers to the public. Do not try to force the motorist to buy something he does not want just because you happen to make it or have it on hand."

Mr. Lovejoy warned the Dixie Distributors that the automobile agency and service station was a potential competitor in the lubrication business. He considers it little more than a matter of weeks until automobile agencies will offer complete lubrication service to their customers.

"Already the automobile sales agency is trying to overcome the problem of lost customer contact. The sales agency sells a man a car this year and never sees him again for a year or two. He is as hard to sell the second time as the first time. They would like to keep on speaking relations with their customers and a systematic lubrication service for them will do it. Remember that 97 per cent of all automobiles are manufactured by 11 companies.

"These automobile manufacturers have the best research laboratories in the country," he said. "They know more about lubricating oil and more about motor fuels than the average oil man knows. They are studying their problem, mainly in an effort to resell their old customers, and they will be difficult to compete with in the business of lubricating automobiles."

E. T. Sadler, the Chicago advertising man, addressed the Dixie distributors on the occasion of their opening meeting. He was followed immediately by George Graham, the insurance man who underwrites most of the properties of the Dixie Distributors Inc. Mr. Graham lives in Kalamazoo.

E. B. RENTMEESTER

It became known at the meeting that the Dixie distributors of Michigan have organized a marketing subsidiary company known as Dixie Service Co. The purpose of this organization is to fill in the gaps between regions where Dixie members can adequately take care of the trade. There are in Michigan a few spots where Dixie gasoline is unobtainable. The towns are not in the territory of any member.

Cases like this will be solved by Dixie Service Co. Its job is to erect a service station in every town in Michigan with 1000 population or more where Dixie gasoline is not already on sale. The company was organized last July and it was this subsidiary that contracted for 50 metal service station buildings from Union Metal Manufacturing Co.

These uniform metal stations with standardized equipment of every kind, are now being constructed at Homer, Olivet, Charlotte, Nashville and Hastings. They are soon to be built in Leslie, Albion and Delton.

Pay Toilets Are a Bar To Undesirables

DETROIT, Oct. 11.—H. A. Allan, proprietor of H. A. Allan & Co., Corunna, Mich. operators of filling stations, relates an experience that tends to further strengthen the idea that the public should be allowed to pay for toilet facilities at filling stations.

One evening, not long ago, Mr. Allan was busy in his station at Corunna when a tramp appeared and demanded to be allowed to use the station toilet. Its location was pointed out to him and he disappeared. In a few moments, he reappeared and, out of curiosity, Mr. Allan investigated to see how well he had appreciated the hospitality accorded him. This hunch proved to be correct—the tramp had abused Mr. Allan's hospitality.

Quickly stepping over to the departing hobo, Mr. Allan demanded that he place the toilet room in as good condition as he found it. The tramp refused—that is, he refused up to a certain point. There is a certain something within the man who is in the right that communicates itself to the man in the wrong and, out of tune with the rest of the world as the hobo was, he caught that something. He knew that he had to make amends for despoiling another man's property, or else.

With bad grace, he proceeded with water, soap and brush, under the direction of Mr. Allan, to do a full half hour's work on the toilet room. After finishing the job to Mr. Allan's satisfaction, the tramp walked away muttering to himself. About that time, the sheriff happened along and, on hearing the story, was for locking the fellow up. Mr. Allan, however, felt that the ends of justice had been served and was willing to let him depart.

Pay toilets will keep out such undesirables. Doubtless, some hobos have a little money with them, regardless of its source but they would hardly wish to part with any of it for toilet facilities. The owner will seldom have to refuse admission to anyone if he has pay toilets—the price takes care of that in most cases. The experience of hotel people shows that the undesirable is almost entirely eliminated by even a 5-cent fee.

The progressive station owner is honest in his endeavor to make his stations real service stations. Surely, human needs are at least as important as automobile needs. Providing the customers with the facilities under discussion will meet with the heart-felt gratitude of the majority of motorists, especially when they see by the presence of the coin device, that everybody that comes along does not have free access to it. That, in itself, will raise the value of the service in his estimation and, in the vast majority of cases, cause him to do his part in acting the man and keeping it clean.

Those having no regard for rights and property of others, never have much of anything anyway, so an admittance charge, however small, would keep most of them out leaving these facilities for those with a sense of decency to utilize.

Neighborhood kids will greatly prefer to spend their nickels for other things than these conveniences and this alone would be a great help toward keeping them in shape for the customer motorist who needs them and will appreciate them.

The Editors' Viewpoint

National Petroleum News

Ax Needed to Hew Expenses and Make Profits

By Warren C. Platt, Editor

THERE is no doubt but that the elimination of price cutting, rebates and discounts in the marketing of gasoline is being done in a most thorough manner particularly in the 11 states of the Standard Oil Co. of Indiana territory. The new modified form of the Q. D. A. which the Standard of Indiana put into effect Oct. 1, is being rigidly adhered to by that company, and is being followed by other important marketing companies there who have used such scales of prices.

It now looks as if the tank car price of gasoline in Group 3 and the west will continue at a good level and not suffer the usual calamitous winter slump. Refiners, instead of holding to their summer high runs of crude oil and putting gasoline in storage, have begun to cut their runs so as to keep their output at about the demand of the market. If this sane policy is pursued, the western refiners should reach the first of the year with comparatively little increase in their stocks of gasoline but with a good tank car price prevailing, something which never before has been true.

There is no reason under the sun, outside of what reason one may find in an insane asylum, why the price of gasoline in tank cars should fall way off in the winter and climb way up in the summer. Its value to the consumer is the same the year around but the refiners in the past have persisted in cutting each other's throats with an excess production of gasoline. This winter it seems as if they will keep their razors in their dresser drawers.

In view of this outlook for a firm and profitable tank car market to the refiner, every oil marketer could well forget any thought that he can get his margin increased by any material decrease in the tank car market, rather he should turn his attention to getting his own net sales price up. That is what the marketers in the Mississippi valley states are doing most successfully.

But in other parts of the country the marketers are paying more attention to trying to break the tank car market than to eliminating their own price cutting and getting their net sales price up.

Along the Atlantic coast where a 2-cent and greater discount largely prevails to the retail trade, marketers are putting in a great deal of time and energy in railing at the tank car market and trying to beat it down, or to find some refiner or broker who will cut under it, in order to get back their old margins. If that same energy and time were devoted by these marketers to cleaning up their own business, to stopping price cuts and waste in management, they might have a fair margin to operate on at present.

The marketer or broker who thinks he is going to break down the present tank car markets is kidding no one but himself. Those tank car markets will hold because there is nothing else for the management to do but hold to them or get out. Notice has been served on the management of many an oil company by its stockholders and board of directors and by the banks, that profits must be made this year or some new people will be put in charge. That is true even of some of the Standard companies. The old system of prices simply could not be maintained any longer and keep the stockholders satisfied.

It is no secret in the oil business that many a big executive has been called on the carpet by the direct representatives of the stockholders and the law laid down to him as to making profits. Profits therefore will be made this year or there will be a new crop of executives. There has even been a shaking up in some of the Standard companies and more shaking-ups will most certainly occur unless there is an immediate return to a reasonably profitable basis.

So with all this taking place, it is foolish for a marketer to think that old conditions of a ruinously low tank car market will return.

The day of the excessively wide margin for the marketer is passed and it may never return because the industry has finally learned something about what the law of supply and demand is, and the oil company executive who happens to forget about that law is going to be given plenty of time by his stockholders to go back to school and learn of it.

Margins of the future are going to be relatively narrow, not too much so for the efficiently operated and well organized company because all companies must make a profit that are entitled to a profit by their sound management.

This is no passing squeeze. The marketers are not being singled out for any special attention by any one. It is the natural outcome of the growth of intelligence in business everywhere, of the tremendous increase in facilities in all business, including oil, as against not so great an increase generally in consuming power of the country. The fit are getting fitter and are putting up a more vigorous fight every day for the business and the man who is less fit is going out to hunt for a new job.

The shaking down has been going on in other divisions of the oil industry for several years. Starting not long after the war there was a vigorous reorganization in oil producing. Many a large company had to cut expense and did so with an ax. The ax is still standing beside the general executive's desk. The change has been more recent in the refining division. The tales one hears of what has been done with the ax are mighty interesting, though sad.

The wise marketer will get himself a fine sharp ax and use it on his expenses and his organization and operating methods and keep it always handy at the desk. If not his stockholders will come with their axes, or else a creditors' committee will walk in, headed by the sheriff.

Aerial Mapping Saves Time and Money Laying Pipe Lines in West Texas

By Paul Wagner
N. P. N. STAFF WRITER

HOUSTON, Oct. 13

USING aerial surveys to determine the best courses for pipe lines across rugged country saved upwards of a million dollars for two great crude oil transporting agencies now building lines in west Texas.

Additional savings will result in actual operation of the line when completed because of lower pumping costs resulting from avoiding grades.

Also it is estimated the aerial surveys will permit the lines to be built and put in use about three months sooner than would have been possible under the old methods of laying out pipe line courses.

One of them, The Texas Pipeline Co., found that the detouring of its right-of-way about 15 miles around a topographic obstruction in the San Marcos region more than paid for its entire aerial survey.

Other savings were brought about by avoiding the necessity for blasting pipeline ditches out of surface rock beds.

In similar manner, the Atlantic Pipeline Co. more than offset the cost of its aerial survey by finding a more direct route to the coast than was originally laid out by surface surveys.

Pipeline contractors, who had the advantage of aerial maps to guide them in making construction bids, were in a position to figure costs more closely than under the old method of using only ground surveys. This is said to have resulted in contract awards for pipeline building at lower than normal construction costs for rugged courses.

The Texas Pipeline Co.'s survey, which was made by Edgar Tobin of San Antonio, extended 240 miles from the vicinity of San Marcos, Hays county, to Sheffield, in the eastern part of the Permian salt basin region of West Texas, all through rugged or isolated areas.

All preliminary surveying was avoided across this stretch of country, although it was still necessary to fix exact and detailed courses by usual field party expeditions. In the flat territory at either end of the 590-mile pipeline system, field party surveys were utilized, as the necessity for aerial reconnoisance work was not apparent.

After the aerial map had been made and accurately pieced together into what is technically called a "mosaic," it was only necessary for engineers to plot the general course of the pipeline between peaks, down valleys and across tablelands. Thus were avoided the topographic "highs" that make necessary blasting of ditches out of surface rocks or the installation of additional booster stations for transporting future oil shipments.

The time element also figures. It is estimated in the case of The Texas Pipeline Co. that its system tapping the salt basin region will be completed three months earlier, because of aerial survey work. Comparable reductions in time required for building the Atlantic system are also credited to the aerial surveying done by the Fairchild Co., Inc.

Construction advantages mentioned for The Texas pipeline will apply similarly in the case of the Atlantic system; perhaps not to as great an extent, however, because the last mentioned carrier traverses a course that is less rugged than the former.

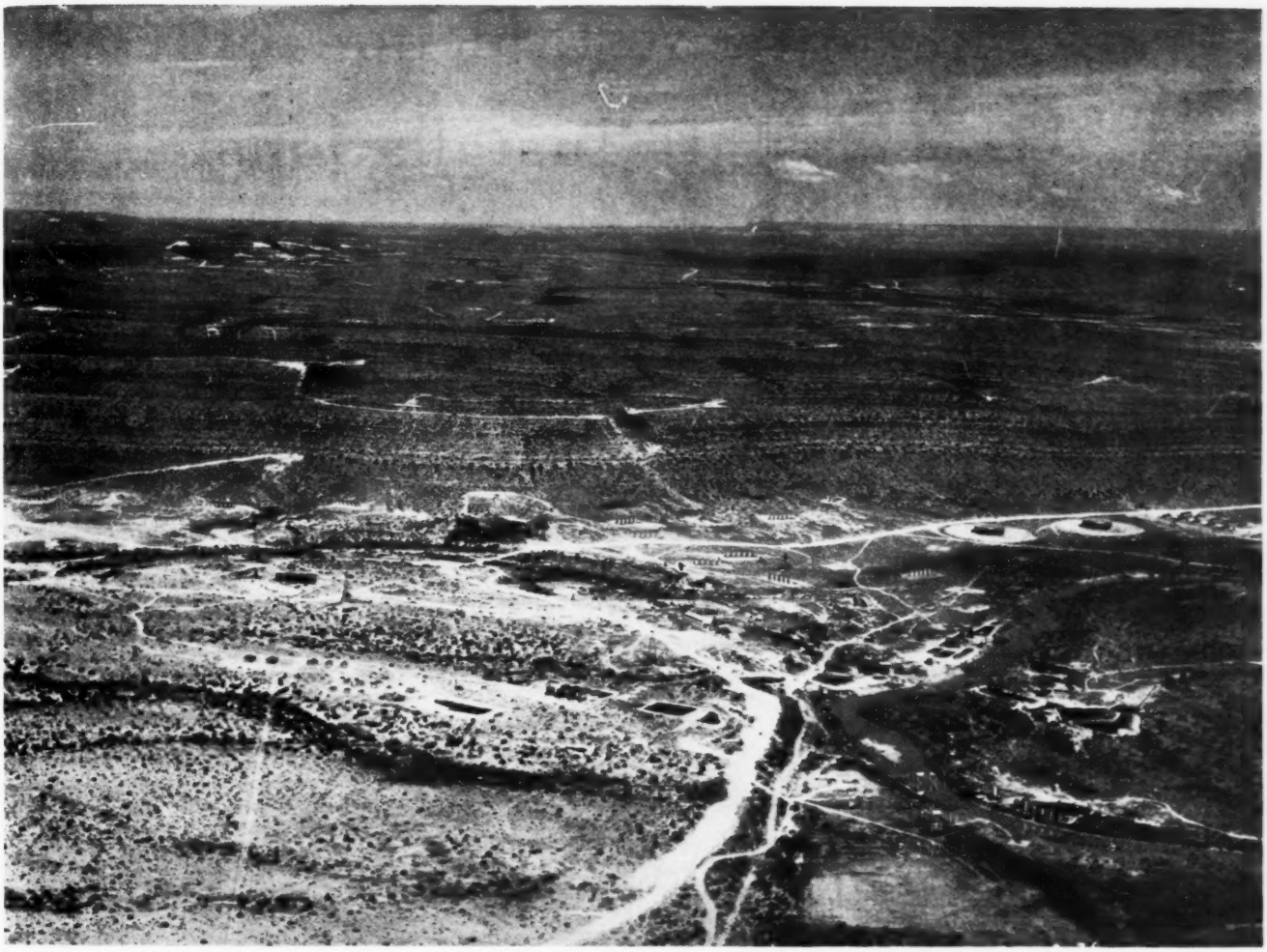
The 10-inch Atlantic pipeline extends 535 miles from Midland, West Texas, to Atreco, in the Port Arthur district of the Gulf Coast. At Midland, it connects with an existing 71-mile "shuttle" line in operation between the Winkler county producing area and the Atlantic's crude concentration base for West Texas.

As changed after its aerial survey, the Atlantic pipeline route swings south of east from Midland, in Midland county; crosses northern Glasscock county south of the Roberts-Settles deep lime field; cuts Sterling county north of its center; passes through the south central parts of Runnels, Coleman and Brown counties; thence as direct as possible to its Atreco terminal.

The line is due to be put in operation before Jan. 1, 1928, under the present construction schedule. As in most pipeline building out of West Texas, construction work is delayed

Copyright, Edgar Tobin Aerial Survey, Inc., San Antonio

Section of map, made by aerial photography along the right of way of The Texas Pipeline Co., near Ozona, West Texas



Copyright, Edgar Tobin Aerial Survey, Inc., San Antonio
The Yates oil field in West Texas, taken from the air

in some instances because of the necessity for transporting materials great distances from railroads, as far as 100 to 150 miles.

Contract of The Texas Pipeline Co. with Smith Brothers of Dallas, calls for completion of its system by March 1, 1928. The Texas pipeline is to be 12-inch for 470 miles from Humble, on the Gulf coast, to eastern Crane county, West Texas, via San Marcos, Junction, Ozona, Yates field and McCamey. From Humble to Port Arthur, a distance of 80 miles, 10-inch pipe will be used. Between eastern Crane county and Monahans another 40-mile section of the system will be of 10-inch construction.

The system will connect at Monahans, in Ward county, with short pipelines built from the Winkler producing territory to the Texas & Pacific railroad by the Landreth Production Co., which properties were taken over by The Texas Co., by purchase last summer.

Eventually, The Texas Co. pipeline may be extended from the Winkler producing area into the Lea county, New Mexico, division of the salt basin, where The Texas Co.'s Rocky Mountain subsidiary holds thousands of acres of potentially productive ground.

In making aerial survey maps inaccuracies of scale have been reduced to one-tenth of one per cent, according to the Edgar Tobin Aerial Survey, Inc., of San Antonio.

If the airplane used in taking photographs could be flown at exactly the same altitude of 12,000 feet all the time, the scale of one inch to 1000 feet of ground covered would be perfect to a hair-line. Due to varying air currents it is impossible to keep the flying altitude constant, but even then the variance of scale comes within the tolerance mentioned when a skilled pilot is employed.

IN THE case of the 240 miles of mapping for The Texas pipeline, the "mosaic" made by piecing the photographic prints together resu'ted in a roll 100 feet in length. At some points areas 10 miles wide were photographed, but generally such a scope of territory was not necessary.

Small prints were also made for stereoptican study, which reveals every highway, railroad, windmill, hill or peak distinctly.

With eight men working and two airplanes, Mr. Tobin estimates his company can accurately map 750 square miles of terrain daily. In The Texas Pipeline Co. survey approximately such a record was set.

Airplanes were transported to the starting point one evening for an actual start to be made of mapping work the next morning. By night, the photographic exposures had been made and the plates delivered to the Tobin studio at San Antonio for development. Night work in the laboratory permitted delivery of the finished mosaic by noon of the following day.

Cameras especially built and equipped for aerial work are used in the surveys. Exposures are made through a hole in the bottom of the airplane cockpit, a spirit level determining when the camera is level.

A large magnifying glass crossed with hair-lines is also built into the bottom of the cockpit for use of the camera man. When the object to be photographed crosses the hair-line the exposure is made.

Exposures always include overlays to insure against gaps; also, each exposure is numbered to facilitate grouping, cutting and mounting in the laboratory.

The camera man and airplane pilot coordinate their work carefully, the pilot signaling when to begin making exposures after getting bearings and beginning his flight away from some good starting point. Thereafter, exposures are made constantly along the route.

The Intermittent Injection of Gas In Gas-Lift Installations

By Morgan Walker*

Presented before Petroleum Division, American Institute of Mining and Metallurgical Engineers, Tulsa, Oct. 19

THAT the intermittent injection of gas to gas-lift installations affords a means of increasing production from wells in their later stages of production, when the rock pressure has declined, is the conclusion of the author. He says, however, that not enough data are available to determine the effect of this method of operating the air gas lift in the early life of wells.

This intermittent method is a variation on common practice in that gas is delivered to the well for a period of short separated intervals instead of continuously.

Figures are given on the effect of intermittent and continuous injection on power consumption and so on.

Figures 2 and 3, reproductions of charts from orifice meters on intake lines, are omitted, because of inability to reproduce them satisfactorily.

INTERMITTENT injection of gas in gas-lift pumping is a variation of the common practice in that the gas is delivered to the well for a short period, called the "on time," followed by a period during which none is admitted, called the "off time," instead of being admitted continuously at a constant rate or by intermittent flowing in which it is occasionally delivered to the well in just sufficient quantity to flow off the accumulated head of fluid. The term "gas" is used throughout this discussion but it should be remembered that in so far as the operation is concerned either air or natural gas may be used.

The equipment at the well is the same as commonly used in gas-lift installations and gas may be admitted to either the tubing or the casing. It seldom occurs that all the wells on a lease can be pumped economically by intermittent injection from one header. Wells that have flow characteristics which permit their being handled together have their intake lines grouped at a central compressor station. Well groups may consist of two or more wells.

The total volume of gas delivered by each group of compressors goes to one well at a time through a quick opening valve, each well connected to the header receiving its charge of gas in turn. Special cases may require a deviation from this arrangement. The distribution of the gas to the different wells is effected by an automatic timing device which operates quick-opening valves on the intake lines. The timing mechanism may be actuated by electricity, liquid or gas pressure. The essential factor in the operation of the timing mechanism is that, as one intake valve is closed, another must be opened.

Water-operated Timing Device

Timing devices operate the intake valves either directly, or indirectly by pilot valves. Of the former type one that is operated by water and has given satisfactory service is shown in Fig. 1 and can be made on the lease. The horizontal cylinder is a piece of 10-inch casing about 7 feet long, closed at each end and free to oscillate about a fulcrum at the center.

A partition in the center forms two compartments so that one may be filled while the other is being emptied. The drain pipe empties into a drain pond with the overflow from the supply tank and the water may be circulated. In order to give the cylinder a rapid starting movement the spring catches *CC* hold the cylinder until the filling compartment is heavy enough to overcome the tension on the spring. The weights are used to balance the cylinder for different time intervals. The valve levers move in the same direction but are fulcrumed on opposite sides with respect to the valve stem so that one valve is opened as the other is closed. Several designs of timing devices operating on this principle are in common use. This type can be used when the flow characteristics of the wells will permit only two wells to be pumped from the same header.

The indirect type consists of a timing device operating a pilot valve which in turn admits gas to a piston or diaphragm on the valve stem. These timers are actuated by a motor through a reduction gear. The electric type of timer is somewhat similar to the distributor on a multicylinder gas engine. The time is varied by changing the speed of the motor and the number of consecutive distributor segments connected to the solenoid which operates the pilot valve. The gas and liquid type of timer controls the pilot valve on the intake valve by suitable cams on a drum driven by the reduction gear. Variations of time are made by changing the speed of the motor and the length of the cams.

An additional relief valve is usually installed on the header and set to release at a safe operating pressure because there is a possibility that all intake valves on the header may, for some unanticipated reason, hold shut.

While the equipment necessary for intermittent injection of gas is being

*Amerada Petroleum Corp., Tulsa.

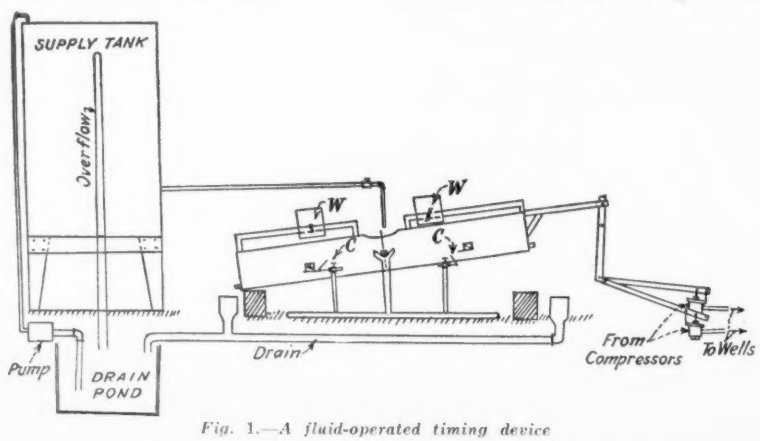


Fig. 1.—A fluid-operated timing device

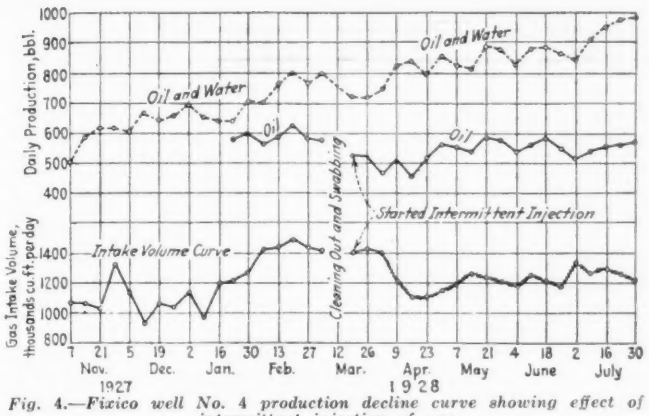


Fig. 4.—Fixico well No. 4 production decline curve showing effect of intermittent injection of gas

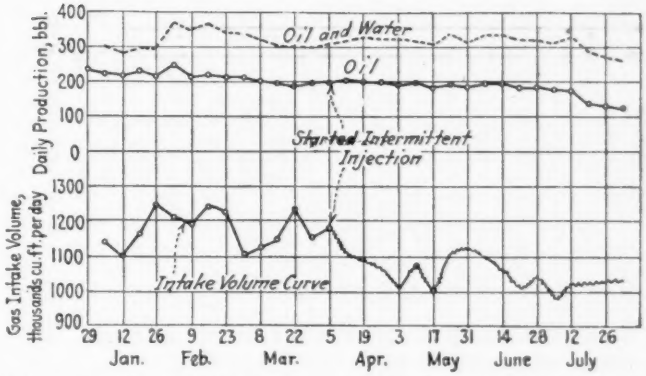

Daily Production, bbl.
Oil and Water
Oil
Started Intermittent Injection
Gas Intake Volume, thousands cu ft per day
Intake Volume Curve
Jan. Feb. Mar. Apr. May June July

Fig. 5.—Cowden well No. 1 production decline curve showing effect of intermittent injection of gas

installed, gas may be delivered to the well continuously through a by-pass and the intake valve installed on the main line. After the intermitter has been tested and the gas separated into the header the by-passes are closed and the gas directed through the intermitter. If the wells are shut down for any length of time the breakout pressure may be excessive if gas is admitted to the wells intermittently due to the delivery of a large volume of gas and the high fluid level in the wells. Under these conditions the wells are usually started by continuous admission.

Determination of Time Interval

When the change from continuous to intermittent injection of gas is made it is necessary to determine the time interval that will give the most economical production. The procedure usually followed is to separate the gas required to flow two wells continuously into one header from which it is delivered to each well alternately and the volume and time interval changed until the best arrangement is found.

If the wells will stand a longer off time than can be obtained with the two wells a third well is added and the best time interval and volume again found. This procedure is continued until all the wells that can be pumped from the header are added to the group. Although effective this procedure may require a great deal of time. In order to assist in obtaining the correct time interval as soon as possible resort was taken to the charts obtained from the orifice meters on the intake lines. The short-time interval and large fluctuations in volume made it difficult to analyze an ordinary 24-hour chart as minutely as was desirable. The use of a clock movement that rotated the 24-hour chart in 2 hours enabled more accurate determination of the flow characteristics. Flow characteristics that cannot be analyzed on the 24-hour chart are at once evident on the 2-hour chart. These records are also valuable for future operation.

Waste In Pumping Energy

A well pumped by intermittent injection of gas to the tubing usually requires delivery of gas to the well after the breakout pressure is reached, because of the small volume of the line from the intake valve to the bottom of the tubing. Since more compressors deliver gas to the installation than would be necessary if the wells were pumped by continuous admission of gas, the compressors will deliver gas under a higher pressure than is necessary to bring the fluid to the surface.

This wasted energy can be saved by determining the volume of gas required to flow each head and adding enough volume to the intake line so that the gas in the gas string under the breakout pressure is enough to bring the oil to the surface. On the other hand, if the volume of the gas string is too high, a waste of energy will result because the pressure must be raised enough to set the oil column in motion regardless of the volume of the gas string. This condition is more likely to exist when the oil is delivered through the tubing, especially if the intake line to the well is large.

If the volume of the gas string is such that the volume of gas expanded from the line after breakout pressure is reached is more than enough to bring the accumulated fluid to the surface, a waste of energy will result and the time required to drain the gas from the line will increase the average pressure on the sand, thereby decreasing the oil production.

Attempts have been made to reduce the maximum pressure required when flowing up the tubing by intermittent injection by the use of a small orifice in the tubing near the liquid level in the well. Some promising results have been obtained. One well making 30 barrels of oil per day was tubed to a depth of 4200 feet with 2½-inch tubing. The lower 140 feet was 3-inch tubing which formed a reservoir for the accumulated oil. A string of 1¼-inch tubing was run inside the 2½-inch and gas introduced between the 2½-inch and 1¼-inch.

Before the orifice was drilled in the 1¼-inch tubing a pressure of 660 pounds did not start the well flowing. After a ⅛-inch orifice was drilled in the 1¼-inch tubing 100 feet above the oil level, the breakout pressure was 220 pounds and the volume of gas required to pump the oil was 55,000 cubic feet per day. The time interval was such that sufficient time could be given for the gas admitted through the orifice to start the oil column in motion. If it is impossible to give the gas admitted through the orifice in the tubing time to set the oil column in motion the advantage is lost. The size of the orifice depends on the time interval as well as the pressure and volume of oil and water to be lifted. At present considerable experimenting is necessary to balance these factors properly.

Intermittent vs. Continuous Injection of Gas

Table 1 shows the effect on well conditions of intermittent and continu-

Table 1.—Effect on Well Conditions of Intermittent and Continuous Injection

Well	Water, Bbl. per 24 Hr.		Oil, Bbl. per 24 Hr.		Working Pressure, Lb.		Inlet gas volume, M. Cu. Ft. per 24 Hr.		Trap gas volume, M. Cu. Ft. per 24 Hr.		Formational gas-oil ratio, Cu. Ft. gas per Bbl. oil	
	Continuous	Intermittent	Continuous	Intermittent	Continuous	Intermittent	Continuous	Intermittent	Continuous	Intermittent	Continuous	Intermittent
Anderson No. 2	239	225	1077	1123	270	245	1516	906	1762	1775	228	773
Cowden No. 4	0	0	1087	1124	290	245	1525	1070	1750	1760	207	613
Nitey No. 3	0	0	986	1024	260	235	1301	897	1365	1135	65	232
Nitey No. 2	0	0	914	900	255	245	904	767	1171	1021	292	282
Nitey No. 4	0	0	873		200		1046		1281		269	
Fixico No. 3	96	116	400	475	286	288	1380	864	1410	1652	75	1660
Rentie No. 3	0	0	508	517	162	173	1014	937	1275	1322	514	745
Killingsworth No. 3	0	0	326	290	152	146	966	860	1082	1130	367	932
Cowden No. 3	0	0	279	285	185	180	1111	578	1220	1200	391	2180

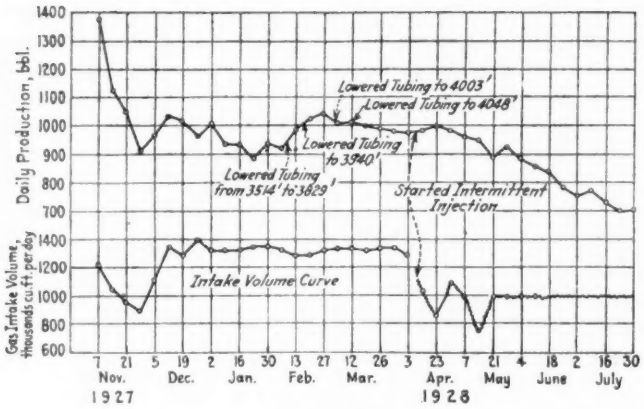

Daily Production, bbl.
Gas Intake Volume, thousands cu. ft. per day
Lowered Tubing to 4003'
Lowered Tubing to 4048'
Lowered Tubing to 3940'
Lowered Tubing from 3514' to 3829'
Started Intermittent Injection
Intake Volume Curve
Nov. Dec. Jan. Feb. Mar. Apr. May June July
1927
1928

Fig. 6.—Nitey well No. 3 production decline curve showing effect of intermittent injection of gas

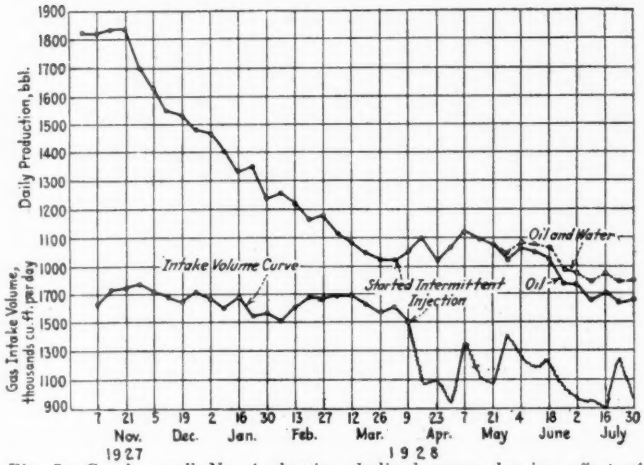


Fig. 7.—Cowden well No. 4 showing declined curve showing effect of intermittent injection of gas

ous injection of gas. The figures are for the period of continuous admission immediately preceding changing to intermittent injection, and for the period immediately following the change. The effect on production by continued use of intermittent injection is shown by Figs. 4, 5, 6 and 7, which are representative of average conditions and show that an increase in daily production accompanied by a decrease in inlet volume is obtained by intermittent injection.

The variation in intake volume is due to admitting gas continuously for a time or to changing the intake volume to find the best flowing arrangement. Although the total fluid in some wells has increased, there has not been a corresponding increase in the volume of intake gas which would probably have been necessary had continuous admission of gas been used. This is particularly noticeable in Fig. 4. Also, in wells from which the daily oil production has decreased without appreciable increase in water the volume of intake gas has not been increased as much as it would were continuous admission of gas used. This is shown by Fig. 7.

The formational gas-oil ratio is usually increased by intermittent admission over that obtained by continuous admission of gas. This is shown in Table 1. The values of gas volumes given in this table have been calculated from planimeter readings of the differential and static curves taken on 2-hour orifice meter charts so that accurate readings could be made of each pen movement. There is some doubt as to whether such violent heads of gas can be measured accurately even though extreme care is taken in reading the charts. Measurements of the gas taken at a gasoline plant meter which was far enough from the leases so that the heads were considerably damped out show that the results given in Table 1 are at least approximately correct. The increase in gas-oil ratio is probably accounted for by the fact that the pressure at the bottom of the hole is lower during the off period than with continuous injection.

When the rock pressure has fallen until the necessary working pressure decreases the production, the pressure differential can be increased enough during the off period to obtain an increase in oil production with the accompanying increase in gas-oil ratio. Since the formational gas-oil ratio is increased there is a question as to whether it is economical to produce a well by intermittent injection of gas. It will be observed that the increase in rate of production is accompanied by an increase in formational gas-oil ratio which is at variance with the prevailing impression that an increase in gas-oil ratio will decrease the recovery. It is true that the data available are insufficient to warrant a definite conclusion but to date they indicate that the ultimate recovery is increased by the use of intermittent injection of gas even though the gas-oil ratio is increased.

Effect On Gravity

An increase in gravity of from 0.3 degree to 1 degree Be. has been obtained by producing with intermittent injection over that obtained by continuous injection. This is probably due to a less intimate contact of the gas with the oil and therefore less distillation of the lighter constituents into the gas. The increase in formational gas-oil ratio, with less dry gas recycled may also have some effect on the gravity as well as account for the increases in the gasoline content of the gas.

Power Consumption

A comparison of the effect of continuous and intermittent injection of gas on power consumption is shown in Table 2. The data are from three leases on one of which there were four wells and on the other two, three wells each. The values of power consumption given are averages for 10 days of continuous and the following seven days of intermittent injection of gas. The power requirement is less for intermittent injection but the pressures against which the compressors work are higher than for continuous injection. The pressure on a well may drop from 400 to 125 pounds during one time cycle, but the discharge pressure from the compressors continues close to the maximum pressures of the wells as it requires but a short time to build the pressure on a well above the operating pressure carried when it is pumped by continuous injection. For this reason compressors should be checked for maximum pressure operation before intermittent injection is begun.

Intermittent injection of gas to gas-lift installations affords a means of increasing production from wells on which the rock pressure has declined. There are not enough data available to determine the effect on wells in the early life but those taken indicate that less benefit is to be derived from intermittent injection in the early life of a well than in the later stages.

BOSTON—R. T. Herndon formerly district manager of the Boston district of The Texas Co., New York and Houston, has been appointed assistant manager of sales in the northern territory, with headquarters at New York City.

J. K. Skillings succeeds Mr. Herndon as district manager at Boston.

Table 2.—Effect of Intermittent and Continuous Injection on Power Consumption

	Continuous injection	Intermittent injection	Change caused by intermittent injection
Production per day:			
Oil, barrel	6,086	6,247	161 gain
Water, barrel	426	530	104 gain
Power consumed, kw. per hr.	1,963	1,686	277 loss
Compressors used	22	18	4 loss
Inlet volume, M. cu. ft. per day	11,863	8,612	3,251 loss
Trap volume, M. cu. ft. per day	13,174	13,844	670 gain
Average operating pressure, lb.	229	224	5 loss

Testing the Mud in Rotary Drilling

GREATER efficiency in drilling with rotaries can be secured if the correct type of mud laden fluid is used and maintained throughout the drilling operations.

The most practical test of the mud is a careful check each day by weight per gallon. A quick and effective method for testing mud samples also is through using an ordinary centrifugal oil-testing machine.

The development of large power-driven slush pumps is desirable to allow more efficient circulation of the necessary volume of mud laden fluid.

These are the chief points brought out in one portion of the paper on "Rotary Drilling Problems" presented by R. S. Cartwright, of the L. W. Prunty Drilling Co., Ponca City, before the Petroleum Division of the American Institute of Mining and Metallurgical Engineering at Tulsa Oct. 18.

Only that portion of Mr. Cartwright's paper dealing with mud laden fluid is republished here.

* * *

THE primary purposes of mud-laden fluid, or mud as it is commonly termed, in its application to rotary drilling, are, first, to carry the cuttings from the hole, permitting them to settle out in the circulating pits, and, second, to wall up the hole, once it is drilled, and seal off minor oil, gas or water sands.

It serves a further incidental purpose in acting as a cooling medium on the cutting tool, and to a limited extent as a lubricant in the hole. To accomplish these ends effectively it must be of approximately the correct density and viscosity, and must have the property of penetrating sands encountered. It must also permit of easy circulation by the slush pumps.

The average rotary operator does not give much serious consideration to the condition of his mud. Generally it is either good or bad according to the individual driller's opinion and experience. Differences of as much as 3 pounds per gallon of mud in use on wells drilling in the same field, under practically identical conditions, have been observed. On one well a difference of as much as 1½ pounds per gallon during a single period of 12 hours has been observed. It is not illogical to assume that certain standards could be worked out for the usual drilling conditions, and that greater drilling efficiency would result if the correct type of mud were maintained, rather than to depend on the hit-or-miss methods sometimes followed.

Mud is a colloidal suspension of finely divided clay in water, the clay being derived from the formations encountered in the hole and the mixture resulting from the cutting and churning action of the cutting tool with water flowing at high velocity from the slush pumps. When drilling in a clay-bearing formation there is a tendency to "make" mud—to form a heavier colloid—while in other formations, particularly sand, there is the opposite tendency that is, for the mud to thin. Normally, there is an excess of mud-forming material drilled, such excess clay settling out in the circulating system, and making it possible, by mixing or thinning with water, to maintain a fluid of fairly identical characteristics.

Test For Mud

As a quick and effective method of testing various samples of mud the writer employs an ordinary centrifugal oil-testing machine. When rotated at a high velocity for a known time the samples separate into their constituent materials, and by using graduated tubes it is readily possible to determine the exact amounts of cuttings, free water, etc., in each. Table 2 shows the results of such a test on four typical muds, taken from four different deep wells in the Mid-Continent district.

Table 2.—Analyses of Four Typical Muds Used in Mid-Continent Wells

Sample No.	Free water, per cent	Clay residue, per cent	Cuttings, per cent	Weight per gallon, (Lb.)
1	2.1	20.7	0.30	9.90
2	1.4	23.0	14.0	9.75
3	....	26.8	17.8	10.60
4	0.9	20.6	14.2	9.90

The several samples differ greatly, although the four wells from which they were taken were drilling under about the same conditions, and the muds were considered suitable by each operator.

It is obvious that the amount of free water should be maintained at a minimum, and that an excess indicates an unstable colloid. The clay residue is largely dependent on the weight of the mud per gallon and varies with it, but should, if the proper weight is maintained, be kept at the lowest possible point. With it, as with free water, the amount deposited is in direct ratio to the stability of the colloid. Cuttings, by which is meant foreign non-mud-forming constituents such as sand and shale, should also be limited as much as possible. Not only do they cause excessive wear in the slush pumps, but in the event of failure in the circulating system they are liable to settle around the bit, preventing either rotation or hoisting.

The most practical test for every day purposes is a careful check of the weight per gallon. If the operator will do this, he will find it easy to maintain whatever standard his experiments prove most desirable. For all general purposes the writer has found that a mud weighing about 10 pounds per gallon is best. In such a mud the free water should not exceed 2 per cent, the clay residue 19 per cent, and the cuttings 1 per cent.

Effect of Heavy Mud

A mud which is too heavy builds up on the walls of the hole and hinders getting back onto bottom after having pulled out. The depositing action on the walls is particularly noticeable in sand formations, and while it is desirable that a sand should be sealed off, mud much heavier than 10 pounds per gallon has a tendency to so reduce the diameter of the hole that it is difficult to get a full gage cutting tool through, thus delaying drilling operations and often requiring some time for reaming the hole back to full gage. If the colloid is especially stable, it is, of course, possible to use a heavier mud without much settling, but such is not usually the case, and it has been the writer's observation that, where mud as heavy as 11 pounds per gallon has been regularly used, considerable time has been required to get back on bottom after a trip out of the hole.

Mud much below the standard of weight favored by the writer, is not sufficiently heavy to carry the cuttings from the hole, thus impeding the progress of drilling. Nor will it properly wall up the hole, making it liable to cave with consequent loss of drilling speed and danger of sticking.

Removal of Cuttings

The most effective method which I have found for settling out cuttings is the use of a long ditch or conductor, through which the mud must pass as it is discharged from the hole. It has also been found that passing it through a settling pit, where it is forced to spread out over a wide area, is also effective for this purpose and leaves the circulating pits free of foreign matter. If the weight of the mud will not be too seriously reduced it is also advisable to inject a small stream of water into it as it is discharged from the hole, in order to facilitate removal of the cuttings.

There is a general opinion among some drillers that the deeper a well is drilled the heavier the mud should be. This theory cannot be sound, for mud performs the same functions at 5000 feet that it does at 2000 feet, and any increase in weight will result in the conditions already referred to This is assuming, of course, that

heavy gas pressures will not be encountered. If such is the case the mud must be as heavy as it is practical to handle, or rather sufficient to maintain the hydrostatic pressure at the bottom of the hole to more than equal the sand pressure.

It is common practice with some operators, after reaching considerable depths to use some crude or fuel oil in the mud, their purpose being to provide a lubricant and a solvent for shale cuttings which might settle around the cutting tool if circulation were suspended. The writer has found that the addition of oil for this purpose is not desirable, as its actual effect is to coat the finely divided cuttings, as in the flotation method of ore separation, making it almost impossible to get them to settle out. There is the further objection that a mud mixed with oil is difficult to handle in the slush pumps, as it has a solvent action on the balata valve disks commonly used in mud pumps. He suggests that the concentration of oil be not permitted to reach more than 2 per cent by volume.

If the cutting tool is stuck, and can neither be hoisted nor rotated due to cuttings settled around it, it is often possible to free it by circulating oil. On the few occasions that it has been possible for the writer to check the concentration of oil required for this purpose, it has been found that not more than 25 per cent by volume is necessary, although in extreme cases pure oil and not an emulsion with mud is required.

Use of Clay Substitutes

When there is no reserve supply it is necessary to use some substitute for clay in mixing mud. Ordinarily cement, lime or plaster, which are easily procured, is used. They are not very satisfactory because, in spite of thorough mixing, they rapidly settle out. Barium sulfate and iron oxide form true colloids, and either, if available, is much to be preferred as a mud-making substitute. For adding weight to mud, iron oxide is particularly desirable as it can be readily used to make a mud weighing from 15 to 16 pounds per gallon. When the addition of such material is necessary, it is common practice simply to dump it in the circulating pits. By using a small tank conveniently located on the derrick floor, and connecting it directly to the slush pump suction pipe one can obtain exactly the mixture desired without sustaining any loss into circulation.

Mud for Deep Drilling

Due to the limitations of existing equipment, it has not been possible to make extensive experiments with reference to the proper volume of mud for deep drilling. The writer has found, however, that a volume of from 400 to 450 gallons per minute with a pressure of about 500 pounds per square inch is desirable for a hole of 11 or 12 inches diameter. For maximum drilling speed the bit must be kept clean by washing, and all cuttings washed from the hole ahead of it.

In hard formations, where drilling speed is reduced, it is entirely possible and desirable in order to save fuel to reduce the volume, but it may be generally concluded that up to a volume of 450 gallons per minute, cutting speed per unit of time is in direct ratio to fluid volume. For holes smaller than 11 or 12 inches diameter it is probable that the volume should be calculated on the basis of the area of the hole for maximum efficiency. It is considered entirely possible, in a small diameter hole, to "wash" the hole, that is, to circulate a sufficient quantity of fluid under high pressure, particularly in soft formations, to cause side wall caving, and it is suggested that this point must be kept in mind in all volume calculations.

A check of the fluid efficiency of slush pumps might provide interesting to many operators. Only by exercising considerable care has it been possible to maintain an efficiency of 70 per cent, which is probably considerably higher than the general field average. If the recommended volume of at least 400 gallons per minute is to be maintained most of the slush pumps now in use must operate at not less than 65 per cent efficiency. It will undoubtedly be found that efforts toward that end will be amply repaid in increased cutting speed.

In this connection, it may be mentioned that the development of large power-driven slush pumps is highly desirable. A number of manufacturers are now working on this problem, but it is certain that if other forms of power than steam are to be applied to rotary operation larger and heavier pumps for power drive than have hitherto been available must be supplied to meet the competition of steam equipment.

Engineers to Meet at Norman

NORMAN, Okla.—A meeting of engineers and geologists Nov. 9 and 10 at the University of Oklahoma is announced by V. E. Monnett, director of the school of geology, H. C. George, director of the school of petroleum engineering and Charles N. Gould, director of the state geological survey.

The morning of Nov. 9 will be devoted to petroleum engineering and the afternoon to geology. In the evening there will be addresses and the following morning will be occupied with round table and question box discussion. The home coming football game will be played on the afternoon of the 10th, Nebraska meeting Oklahoma.

Court Enjoins Cut In "Gas" Price

CHICAGO, Oct. 16.—Judge Fred W. Brennen in district court at Flint, Mich., on Oct. 13 issued a temporary injunction restraining the White Star Refining Co., Zero Oil Co., Morrison Oil Co., Standard Oil Co. of Indiana, and Sun Oil Co. from selling gasoline below 20.8 cents, service station price.

The application was prayed for by the Arcade Oil Co., McKay-Hassett Oil Co., the Flint Motor City Oil Co., the Custer Oil Co. and the Consumers Oil Co. The court action was the outgrowth of a reduction in price of 2 cents a gallon on Oct. 11 which affected service station but not tank wagon price.

It is understood that two of the companies mentioned in the petition were the leaders in reducing the price and the other companies followed immediately.

Venezuela Acts Against Waste Petroleum

HOUSTON, Oct. 12.—Oil interests operating concessions along Venezuelan shores are being required to prevent contamination of the waters by waste petroleum, according to a translation of the new law made public through the Department of Commerce at Washington.

The Venezuelan law provides that sediments of discharging tanks be transferred into special boats taking them to previously designated shore places for disposal.

Discharging tanks must be equipped with registering device indicating when the oil surface has reached its maximum height.

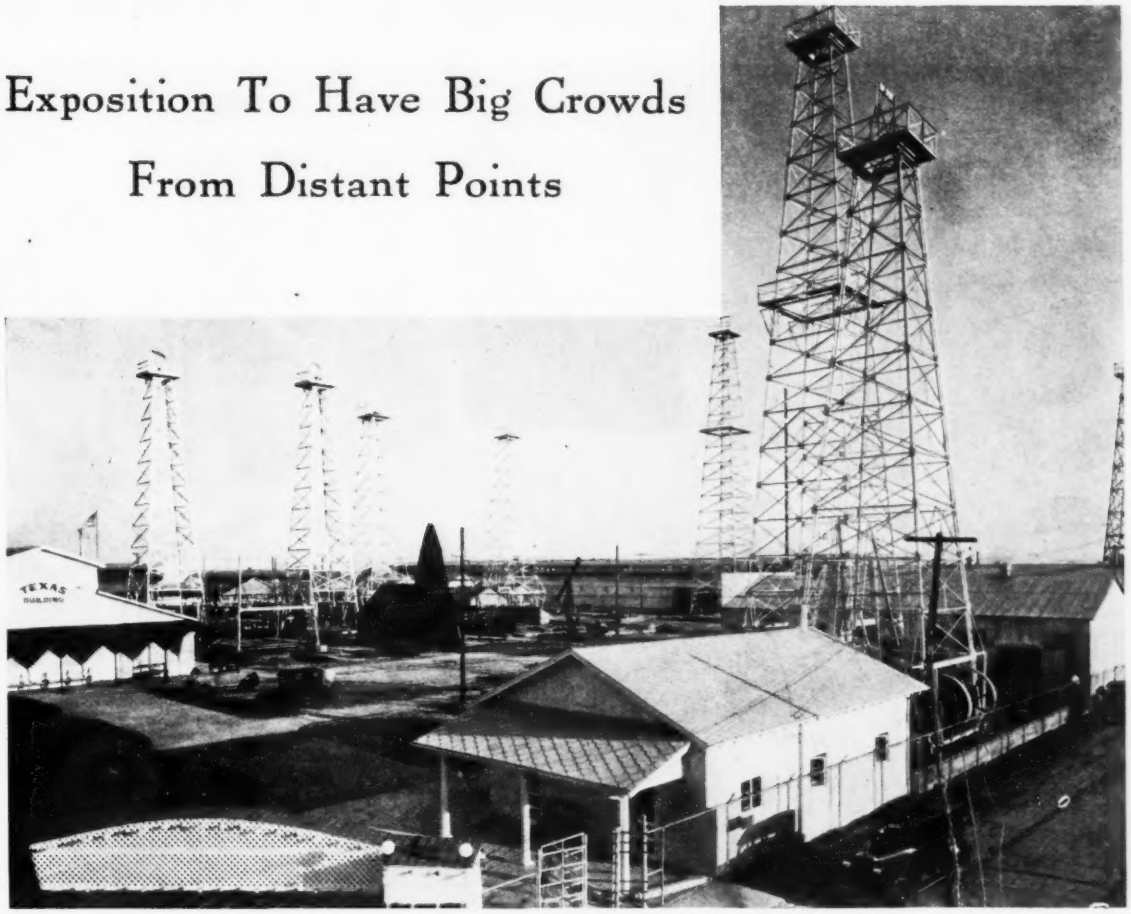
In drilling wells, companies must advise the fiscal inspector so that he may investigate and see that precautions have been taken to prevent contamination of waters.

Ships sailing within territorial limits are prohibited from pouring into the waters any crude or fuel petroleum, or any Diesel oil, or mixed waters containing more than 0.05 of one per cent petroleum, that is, a sufficient quantity to form on the surface of the water an iridescent film visible to the naked eye and in a bright atmosphere.

Late Market Change

SHREVEPORT—On Oct. 16 Louisiana Oil Refining Corp. advanced Urania, La., crude 5 cents, making new price 90 cents per barrel.

Exposition To Have Big Crowds From Distant Points



Grounds of the International Petroleum exposition, Tulsa, with nearly all the derricks up

The Howards

IT IS customary to say at this juncture that everything is in place and ready for the opening of the International Petroleum Exposition. It wouldn't be quite accurate to say it now, but it will be by next Saturday when the show will be officially opened to the public.

Advance rumblings from nearby and outlying points indicate that this will be quite a well attended exposition. Throughout the oil country, expeditions by train and auto, are being organized. Fort Worth will run a special train, with about 300 on board; Tampico will have a special car with 35. Ada, Okla., which is wishful of becoming an oil town, will have a special train.

The Drumright citizenry have taken it on themselves to organize the Cushing district and Guthrie, Okla., which by virtue of the active Logan county fields is getting to be something of an oil center, plans to come over in 200 or more automobiles.

Wichita, Kans., the airplane manufacturing center of the west, is featuring its ships and a large number of airplanes will make two or three round trips daily bringing exposition visitors.

Every oil company in the Mid-Continent has arranged to bring in the field men. One company says that the attendance by its employes, spaced out over the 10 days, Oct. 20-29, will total 250 men.

The exposition grounds this year surpass anything that has yet been done. Last year there was a county fair immediately adjacent to the exposition grounds. It didn't interfere particularly, but it jumbled the appearance of things. The fair was finished several weeks ago and the exposition will have a free hand.

* * *

TULSA, Oct. 15.—Twenty-three teams will compete in the fourth annual Mid-Continent Petroleum First Aid Meet to be held here on Oct. 22, it was announced today by Don J. Wallace, director of the safety division of the Mid-Continent Oil & Gas Association. The meet will be held on the grounds of the International Petroleum Exposition starting at 2 p.m.

The 23 competing teams will represent 16 companies. They will come from every Mid-Continent state. Many of the teams will come to the meet with a background of actual experience on the job in which they have saved the lives of fellow workers by prompt application of first aid methods.

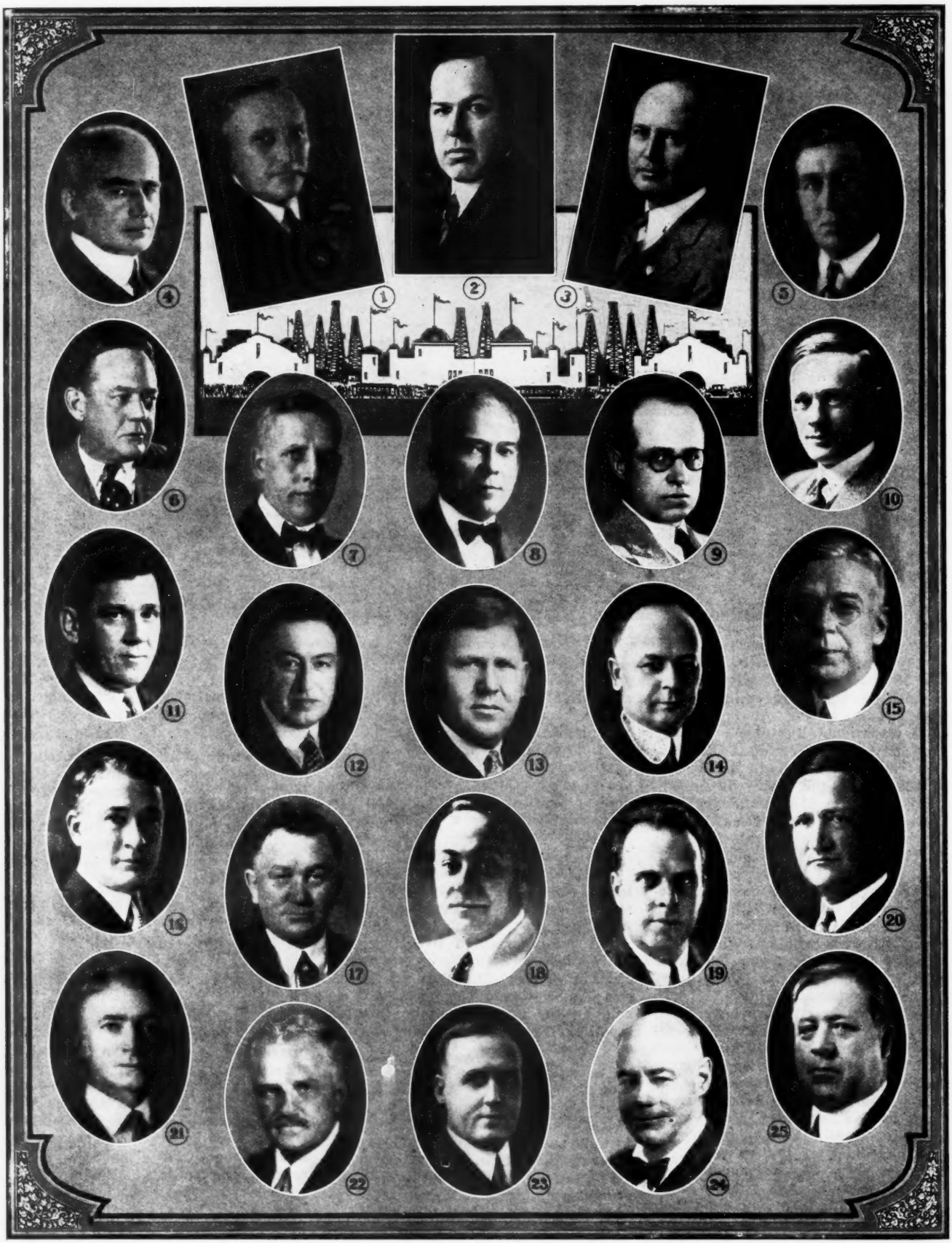
Since the safety movement has gotten under way in the oil industry more than 14,000 workers have received first aid training in the Mid-Continent territory alone. This number is constantly increasing. Beginning Nov. 1 training will be started through the West Texas fields in Crane, Upton, Winkler and Pecos counties.

The winning team in the forthcoming meet will be awarded a silver loving cup by the petroleum exposition. The Mid-Continent Oil & Gas Association will award gold medals to every member of the winning team and the National Safety Council will give each man a silver medal.

The second best team in the first aid contests will win silver medals from the association and bronze medals from the National Safety Council. Members of the third team will receive bronze medals from the Mid-Continent Oil & Gas Association.

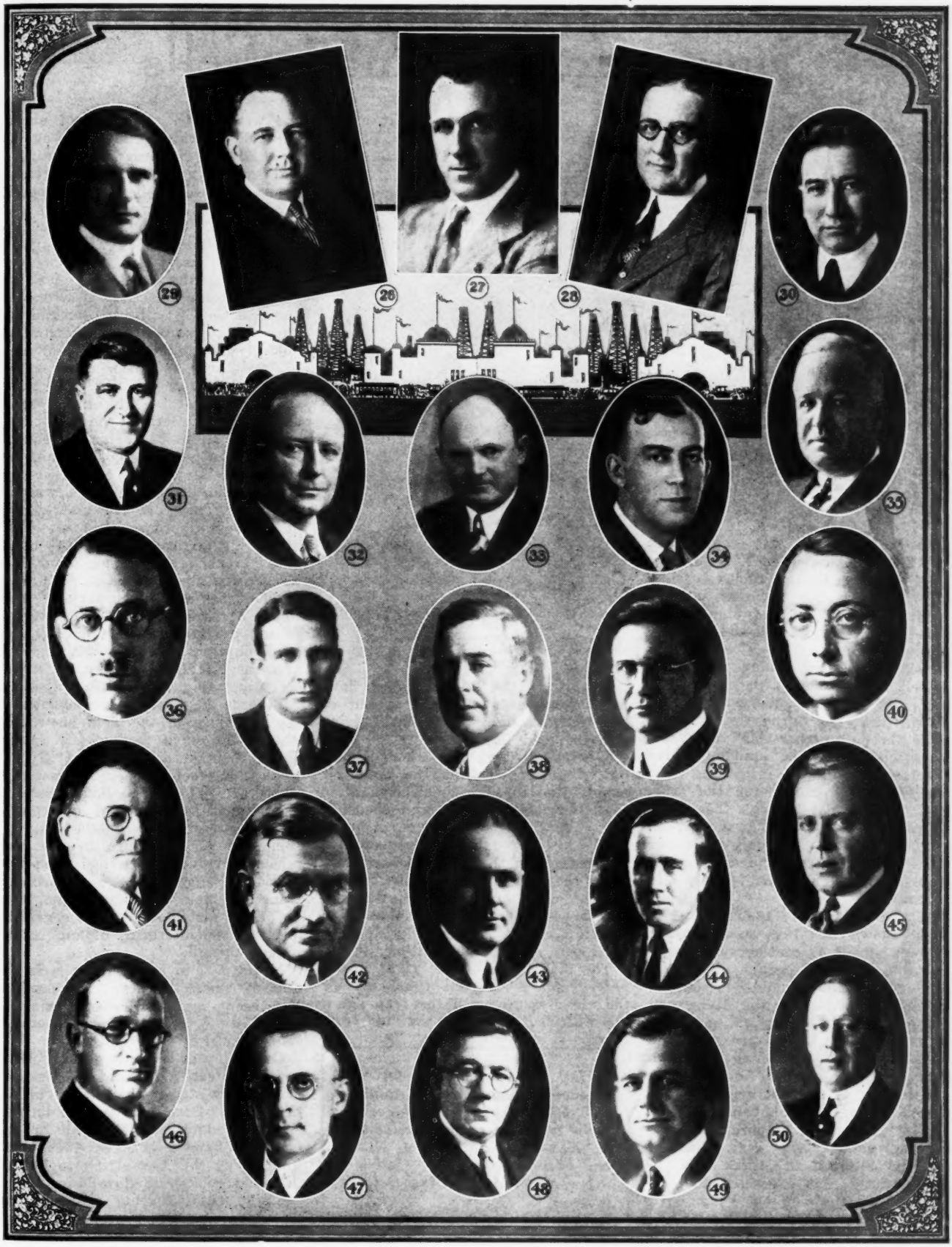
Presentation of the medals and prizes will be made at a banquet at the Mayo hotel which is sponsored by the U. S. Bureau of Mines, the National Safety Council and the Mid-Continent Oil & Gas Association. D. W. Moffitt, vice president of the Mid-Continent Petroleum Corp. will present the medals. The principal speakers of the evening will be Charles B. Scott of Chicago, past president of the National Safety Council; and H. C. Fowler of the U. S. Bureau of Mines, Washington. Warren C. Platt, editor of NATIONAL PETROLEUM NEWS will be toastmaster at the banquet.

Board of Directors of the International



1—A. W. Leonard, Treasurer, I. P. E., Vice. Pres. Devonian Oil Co., Tulsa; 2—W. G. Skelly, President, I. P. E., President, Skelly Oil Co., Tulsa; 3—William Holden, Secretary, I. P. E., Secretary, Chamber of Commerce, Tulsa; 4—J. Edgar Pew, Vice-Pres., Sun Oil Co., Dallas; 5—D. D. Wertzberger, Wertzberger Derrick Co., Tulsa; 6— Walter Gray, President, Jarecki Sup. Co., Tulsa; 7—R. M. Young, President Carter Oil Co., Tulsa; 8—R. C. Sharp, President Okla. Nat'l. Gas Corp., Tulsa; 9—Waite Phillips, Chm. of Bd., Independent O. & G. Co., Tulsa; 10—Victor H. Smith, Vice-Pres. Gulf States Terminal and Transport Co., Tulsa; 11—R. E. Day, President, Magneto Ignition Corp., Tulsa; 12—O. C. Staples, Machinery Mgr. Frick-Reid Sup. Co., Tulsa; 13—J. M. Post, Manager, Oil Well Supply Co., Tulsa; 14—Harry Smith, Secretary, Mid-Continent O. & G. Ass'n., Tulsa; 15—Robt. W. Egan, Gen'l. Mgr. Oil & Gas Journal, Tulsa; 16—J. P. Flanagan, Oil Operator, Tulsa; 17—A. A. Beard, Gen'l Supt. Tidal Oil Co., Tulsa; 18—A. F. Bourne, Secy.-Treas. Okla. Iron Wks., Tulsa; 19—Frank R. Billingslea, Oil Operator, Tulsa; 20.—Clyde Pape, Secy.-Treas., Selby O. & G. Co., Tulsa; 21—P. D. Hayes, Exchange Nat'l. Bank, Tulsa; 22—Walter Miller, Vice-Pres., Marland Refining Co., Ponca City; 23—Fred Insul, Pres. Public Service Co. of Okla., Tulsa; 24—B. E. Horrigan, 1443 So. Cheyenne, Tulsa; 25—H. V. Foster, President, Indian Territory & Illuminating Co., Bartlesville.

Petroleum Exposition, Tulsa, Oct. 20-29



26—Alf. G. Heggem, Vice-Pres., I. P. E., Pres., Oil Well Improvements Co., Tulsa; 27—J. Burr Gibbons, Gen'l Mgr., I. P. E., Vice-Pres., Oil Well Improvements Co., Tulsa; 28—Frank Hinderliter, Vice-Pres., I. P. E., Vice-Pres., Hinderliter Tool Co., Tulsa; 29—Jacob France, President, Mid-Continent Pet. Co., Tulsa; 30—R. A. Griffith, President, Sinclair Oil Co., Tulsa; 31—Ernest Nicklos, Manager, Texas Co., Tulsa; 32—Harry H. Rogers, Exchange Nat'l. Bank, Tulsa; 33—Clyde Alexander, Vice-Pres., Phillips Pet. Co., Bartlesville; 34—W. M. Bovaird, Secy.-Treas., Bovaird Supply Co., Tulsa; 35—Brooks Gutelius, Manager, Continental Supply Co., Tulsa; 36—J. H. Satterwhite, Pres., Nat'l. Gaso. Supply Mens Assn., Tulsa; 37—Robt. F. Garland, Oil Operator, Tulsa; 38—D. F. McMahon, Oil Operator, Tulsa; 39—J. M. Hayner, Hayner Royalty Co., Tulsa; 40—Warren C. Platt, NATIONAL PETROLEUM NEWS, Cleveland, O.; 41—W. A. Schlueter, Pres., Refinery Supply Co., Tulsa; 42—J. S. Sidwell, Supt. Prairie Oil & Gas Co., Tulsa; 43—Ray L. Dudley, Pres., Gulf Publishing Co., Houston; 44—Joe McGraw, McGraw Oil Co., Tulsa; 45—Ralph B. Pringle, Vice-Pres., Independent Oil Co., Tulsa; 46—C. P. Dimit, Vice-Pres., Gypsy Oil Co., Tulsa; 47—O. T. Dawson, Division Mgr., National Sup. Co., Tulsa; 48—Henry Greis, Westcott & Greis, Inc., Tulsa; 49—J. H. Brooks, Republic Supply Co., Tulsa; 50—George A. Dye, Vice-Pres., Wilcox O. & G. Co., Tulsa.

Automatic Liquid Level Flowing Device Successful on Small Wells

AN AUTOMATIC oil well pump of the air or gas displacement type, invented by George B. Small, Tulsa engineer, has been given a long trial under actual operating conditions and is now pronounced successful. Incidentally, it is being shown to the industry at the International Petroleum Exposition. Mr. Small has applied for patents.

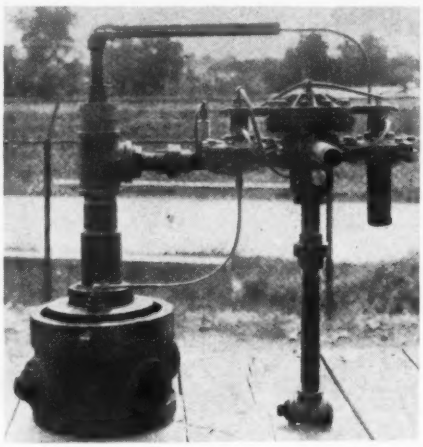
Precisely, the machine should be described as a liquid level controlled valve. Automatic displacement pumps have been invented and used in a variety of forms for many years. Nearly all of them have depended upon floats to release the air or gas supply. At this point the Smallamatic, as the new device is called, departs from the usual pattern.

Equipment in the hole consists of a trap made of 4-inch tubing which is swaged to the bottom of the 2-inch string of tubing and run to near the bottom of the hole. The trap used in the 25 wells on properties of the Tidal Oil Co. in the Chelsea, Okla. district where the machines are in service, is about 40 feet long. It is closed at the bottom and has a standing valve.

Inside the 2-inch tubing there is a ¾-inch string. This is the flow string and is connected to the lead line at the surface. The purpose of the trap is to keep pressure off the sand. By special cage, the standing valve is screwed to the ¾-inch line. The only way fluid can enter the trap, or closed liner, is through the standing valve. As the valve at the bottom of the trap operates only once per barrel of oil lifted—the trap holds approximately one barrel—long life is assured.

At the surface is the small machine shown in the accompanying photograph. It is considerably smaller than the photograph indicates, weighing only 35 pounds. It consists of three diaphragms, the large one in the center controlling the main air or gas supply, under pressure, the one at the right controlling the large diaphragm and turning on the air and the one at the left actuating the main diaphragm to shut it off.

From the smaller diaphragm at the left, or nearest the casinghead, a pilot line, ¼-inch size, goes into the well. This is not connected to anything within the well but hangs to a point somewhere near the top of the 4-inch trap and outside of it. As the oil level in the hole is the same as that in the trap, it will rise and close the end of the pilot tube, forming a liquid seal. When this happens, there is a rise in pressure in the pilot line sufficient to unseat a ball valve which up to this time had been held in position by the diaphragm. When this happens, air is released to actuate the large diaphragm which in turn releases the valve controlling the air in the main line from compressor to well. It enters the well through the 2-inch tubing, flowing the contents of the trap out of the well through the ¾-inch string into the lead line.



The Smallamatic, showing machine on floor beside casinghead. Small line leading into well is pilot tube which is closed by rise of oil in the hole, turning on main air supply to flow well

Whereas it is the air which is permitted to escape from the main air supply line through small orifices in the assemblage that is responsible for holding the diaphragm in place until it is moved by the accumulation of pressure in the pilot line, substantially the same thing happens to shut off the main air line when the well has flowed all of the fluid that is in the trap, except that the pilot line has nothing to do with the shut-off.

The diaphragm on the right in the photograph is the one that cuts off the air pressure until the trap again fills with oil. Following the fluid from the well, there is a rush of air up the tubing which builds up against the shut-off diaphragm, unseating a ball valve and releasing pressure against the main diaphragm, thereby closing the main turn-on valve.

Side outlet is provided so that the air in the flow string is quickly released to atmosphere.

In the early stages of the two years of experimentation with this machine, Mr. Small used pistons for the purpose diaphragms are now employed. The minor and the main pistons were equipped with leather cups to make them air tight against the walls of the cylinders. Due to air and hot weather, the cups dried out and had to be replaced frequently. Corrosion of the pistons also resulted.

Then the diaphragm idea was introduced. These are thin plates, made of phosphor bronze and as their movement vertically is only ⅛ of an inch, breakage is unimportant. In shop tests, they operated a total of 66,000 times without breaking. That would be equivalent to 66,000 barrels of oil produced without replacement of diaphragms. When replacement is necessary, it is at a cost of a few cents and is quickly and easily done.

Records kept on the operation of the machines in the field show that about 200 cubic feet of air is required to produce a barrel of oil from wells 400 feet deep. Because the whole principle of the Smallamatic is based upon the gradual overcoming of one pressure by another—an accumulation of pressure in the well releasing valves which had been held closed by slight leakage of pressure from the main air supply—the turn-on of the air into the trap is gradual and no violent surge of air results to cut the oil.

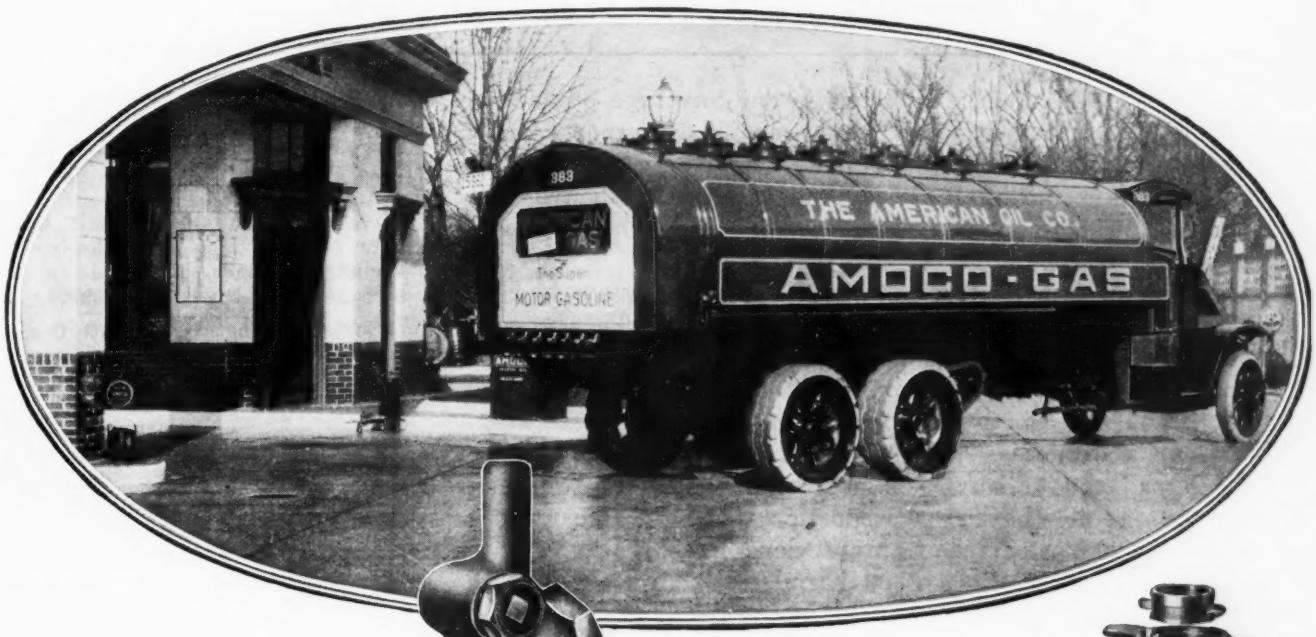
In the 300 to 500 foot wells in the Chelsea district where the machine has been used for several months, the flowing pressure has averaged 150 pounds.

On wells of depths greater than, say 1500 feet, a booster hole is used in the flow string which gives an air lift effect. Such hole is 1/32-inch in size and admits sufficient air or gas from the space between the 2-inch tubing and the flow string to lighten the fluid enough to flow it easily.

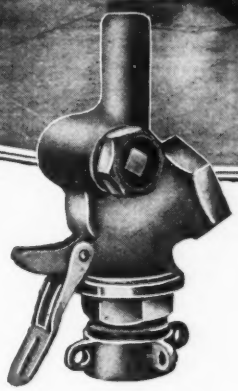
Slight readjustments are made in the surface arrangement of air tubes to diaphragms to operate the machine where back pressure is held on the well. The arrangement is the same for wells operating under vacuum or without where back pressure is not held.

THE series of articles on "Accounting Methods for Refineries" by Henry W. Ralph, which have been appearing exclusively in NATIONAL PETROLEUM NEWS, *will be resumed with the publishing of Article 8 in the Oct. 24 issue.*

This article will discuss the three general types of reports which should be made on operations in processing plants, including filtration plant, wax plant, cold settling plant and so on.



Amoco Tank Truck equipped with seven Wheaton Type A Faucets—like the one more clearly shown in the illustration at the left.



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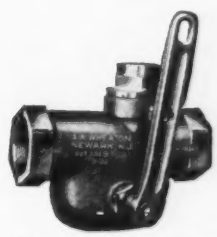

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Review of Late Production News

A DECREASE of 17,900 barrels in daily average production in Winkler county, west Texas, was chiefly responsible for the decrease of 18,500 barrels in daily average crude production in the country during the week ended Oct. 13, when output totaled 2,505,500 barrels, according to American Petroleum Institute.

Crude oil imports totaled 207,857 barrels daily average, an increase of 63,571 barrels over week ended Oct. 6. This brought total crude supply for week ended Oct. 13 to 2,713,357 barrels, compared with 2,668,286 barrels previous week.

Seminole area production was steady the past week. St. Louis pool increased 5350 barrels.

Pecos county, west Texas, decreased 4050 barrels on daily average. Total west Texas production was 333,600 barrels, a decline of 20,250 barrels from previous week.

Long Beach declined 3000 barrels. There were smaller changes in other fields.

Oklahoma-Kansas

THROWING open the area of the Barnsdall Oil Co. No. 1 Fife, in 14-8-5, leaves the Mission pool the only area in the Seminole region in Oklahoma with any drilling restrictions in force at the present time.

In addition to two new locations made near the Barnsdall well, three wells are drilling in the field. The producer swabbed 734 barrels the first 16 hours it was opened up. Installation of the air/gas lift is expected to increase its production. It refuses to flow naturally.

Lack of drilling water continues to delay a number of completions in the St. Louis pool. Magnolia Petroleum Co. had a water well in its No. 1 C. Youts, east of the field, between the big production and the Mid-Continent No. 1 Guinn, in the SW SE NE of 20-7-5.

An overlooked spot in the Oilton field of eastern Creek county, Okla., is proving productive. The Silurian Oil Co. No. 1 Clifford, in the NE NW of 7-19-7, is making 600 barrels daily from the pay, believed to be the top of the Wilcox, at 3149-51 feet.

Two new locations have been made in vicinity of the producer of the Gypsy-Marland-Bu-Vi-Bar interests, in Sedgwick county, Kans. This well, which is producing from an as yet, unidentified pay in the Simpson or post-Wilcox series, is still making 1680 barrels from two feet of pay drilled, a production figure from which the well has not varied ten barrels since its completion more than two months ago.

Gray county, in the Texas Panhandle, has two wells with productive possibilities, but they have as yet not been sufficiently completed to estimate their production.

California

A COMMITTEE composed of engineers from six California oil companies, estimates that the production peak at Santa Fe Springs will be 319,000 barrels, reached in January, 1929. The estimate is based on the assumption the new deep Buckbee zone will equal the upper Meyer sand in the same field in richness of sand and in area and figuring that 250 wells will be drilled to completion.

It also was estimated that present pipe lines can take care of the new production. No additional steel storage will be needed.

Two Marland wells at Seal Beach have drilled into the deep Wasem sand and tests of only five feet of sand below the shoe indicate that the wells will be good producers. These two wells offset Standard acreage which means the Standard must drill offsets.

Texas, New Mexico, Louisiana

ANOTHER Edwards lime field has been opened in Caldwell county, central south Texas, on an *en echelon* fold about six miles south-southeast of earlier Luling production.

The discovery, which may prove the forerunner of development equaling the scope and production of Luling, was made by Sun Oil Co., drilling in its No. 1 Malone test, in the A. Floyd survey. The Edwards lime was topped at 2707 feet and drilled to 2734 feet.

At this depth the well swabbed 270 barrels in seven and a half hours, Oct. 10. It had been flowing by one-minute heads every one and a half minutes before swabbing.

Surface formations indicate to geologists that main production from the Edwards lies east-northeast in that part of the area known as the "Salt Flats." Acreage there is owned mainly by major companies, principally the Humble Oil & Refining Co. for its own account and in partnership with Luling Oil & Gas Co.

Luling field production, from the "Shoestring" area of a faulted-fold, reached between 45,000 and 50,000 barrels daily average at its maximum. The producing area covered between 1500 and 2000 acres.

The Arizona Mining & Engineering Corp. extended the main Winkler area in West Texas south into Sec. 10, Block B-12, when it made a well at 3004 feet. It was estimated good for up to 3000 barrels daily. It is on a line between the earlier south end Winkler production and the Richardson and other O'Brien discovery in Sec. 50, Block 5.

Wyoming, Montana

PRODUCERS & REFINERS CORP. has succeeded in shutting in the Muskrat gas well, 75 miles west of Casper. No announcement has been made concerning the disposition of the gas which is estimated at 70,000,000 feet.

Cody Petroleum Co. completed its No. 4 Klindt, in the Oregon Basin field, in Wyoming, with an initial production of 2000 barrels, one of the best wells to be completed to date.

The Texas Production Co. has reported the Dakota sand dry in its Alkali Butte well in Fremont county, Wyo. The test will be continued to the Lakota.

Ohio Oil Co.'s wildcat on the Shoshone anticline, in Park county, Wyo., has 2000 feet of high grade black oil standing in the casing as the well is being drilled in.

In the Pondera field, in Montana, Continental Development Co. completed a well good for 500 barrels settled production. There were six other completions in the field, which now has a production of 2500 barrels a day. There are 25 wells rigged up or drilling.

Ban on Drilling Lifted in Barnsdall Area In the Seminole District

By John Power
N. P. N. STAFF WRITER

TULSA, Oct. 13

RESTRICTIONS have been loosened on another shut in area in the Seminole district.

The area surrounding the Barnsdall Oil Co. No. 1 Fife, NE NW of 14-8N-5E, is to be tested.

The Barnsdall well, which had been shut in to nominal production for several months, was opened recently, and, although the well did not flow, it swabbed 734 barrels in 16 hours. Preparations are going forward to install air/gas lift equipment.

A location offsetting the well diagonally to the northeast, in the SE SW of 11-8-5, has been made by the Sinclair Oil & Gas Co. Another location, a half mile north and a location east of the producer has been made by the Empire Oil & Refining Co.

There are three wells drilling at present, two of which should be in before long. White Eagle Oil & Refining Co. and McMan Oil Co. are about 3000 feet with their well in the NE SW SE of 9-8-5, while T. B. Slick is close to 4000 feet in his well in the NW SW SE of 13-8-5.

The start of drilling around the Barnsdall well leaves only the Mission pool under any sort of a restriction agreement on drilling. Not a great deal is known about the potentialities of the Mission area, although it is felt by some that it may prove to be a highly productive region. The field was discovered last November, when the Gypsy Oil Co. completed its No. 1 Doser, SE SE NE of 7-8-6, for an initial production of 1120 barrels from the Wilcox sand at 4465-66 feet. The best well to be completed since that time has been the Gypsy Oil Co. No. 1 Barkus, in the SE SW of 6-8-6, which had an initial of 4220 barrels from the Wilcox at 4206-10 feet.

There have been several dry holes drilled fairly close in on nearly all sides of the proven area. The Texas Co. got a salt water well in the Sw of 12-8-5, a mile southwest of production. The Prairie Oil & Gas Co. had a failure in the NW SE NE of 18-8-6, half a mile south of the nearest producer. The Magnolia Petroleum Co. put down a dry hole in the SE NW of 17-8-6, a mile southeast of the nearest oil well. The Amerada Petroleum Corp. had two failures in 8-8-6, one an offset to the discovery well, while the Twin State well in the NW NE NE of the same section is but an indifferent producer, with waterish tendencies.

The Roxana Petroleum Corp. is almost down with a well it is drilling in conjunction with the Marland Production Co. in the NW NW NE of 7-8-6, a diagonal southeast offset to the Gypsy Oil Co. No. 1 Barkus. W. L. Kistler has a rig up on a location offsetting the Gypsy producer to the south, while the Minnehoma Oil & Gas Co. has made a location in the NE NW NW of the same section.

Lack of adequate water for drilling continues to delay development in the Wilcox area of the St. Louis pool. From indications given by what wells were completed, however, the pool bids fair to conform to the usual characteristics of true Wilcox sand pools, i.e., to be small in extent, and extremely high in acreage recovery.

East of the field, in the important territory between the heart of production and the Mid-Continent No. 1 Guinn, in the SW SE NE of 20-7-5, the Magnolia registered a Wilcox sand failure with its No. 1 C. Youts. This well, in the NE SE SW of section 20, had 3200 feet of oil in the hole from the Simpson when the Wilcox was reached at 4249 feet. Water appeared after drilling two feet of the Wilcox and drilling was stopped. The well was plugged back to the Simpson, where it swabbed 129 barrels.

The Sinclair No. 2 Nadash also was a Wilcox failure. Topping the sand at 4298 feet, this test, located in the SE NW NW of 29-7-5, drilled to 4304 feet, getting 2500 feet of salt water in the hole as a reward. Water was not all that came in, though, for the sand heaved, and filled 125 feet back up the hole.

Production from the Wilcox area continues to fluctuate daily, though holding up well above 80,000 barrels of Wilcox oil. This fluctuation is said to be the result of the variation of the air as applied to those wells which are being flowed by means of the air/gas lift.

Perhaps the most likely well of the week in the field was drilled to the top of Wilcox, from which it swabbed about 750 barrels in 18 hours. It is the Magnolia No. 1 H. E. Youts, and is located in the NW SW of 20-7-5, offsetting the famous Youts lease of the Independent Oil & Gas Co. in 19-7-5. No water came with the oil, and if none appears from the present total depth of 4314 feet, which is but a short way in the sand, it is probable that the well will be drilled deeper. A comparative table of production from the Wilcox sand in the St. Louis pool follows:

Company	Well No.	Production Oct. 12	Production Oct. 5
Barnsdall	1—Stahl	1,295	*707
Gypsy-Sinclair	1—Stahl	5,442	5,554
Gypsy-Sinclair	2—Stahl	6,898	6,174
Phillips Pet. Co.	2—Stahl	5,645	5,975
Sinclair	1—Nadash	1,445	1,720
Magnolia	1—Hembree	6,193	459
Magnolia	2—Hembree	6,402	5,512
Magnolia	3—Hembree	6,834	.....
Magnolia	4—Hembree	.....	6,830
Magnolia	1—A. G. Youts	570	.....
Magnolia	2—A. G. Youts	6,701	3,710
Magnolia	2—C. A. Youts	322	268
Magnolia	1—T. Fyke	586	.....
Slick	1—Hembree	4,214	4,915
Slick	2—Hembree	5,435	5,320
Slick	3—Hembree	6,015	6,047
Slick	4—Hembree	.....	.....
Mid-Continent	1—Guinn	2,890	315
Independent	1—Youts	6,340	6,870
Independent	2—Youts	2,265	4,130
Independent	3—Youts	4,610	4,645
Independent	4—Youts	3,855	3,125
Independent	5—Youts	4,485	4,425
Independent	6—Youts	1,945	2,055
Independent	7—Youts	685	.....
Prairie	1—Wolfe	1,080	1,050
Total		88,809	83,635

*Six hours.

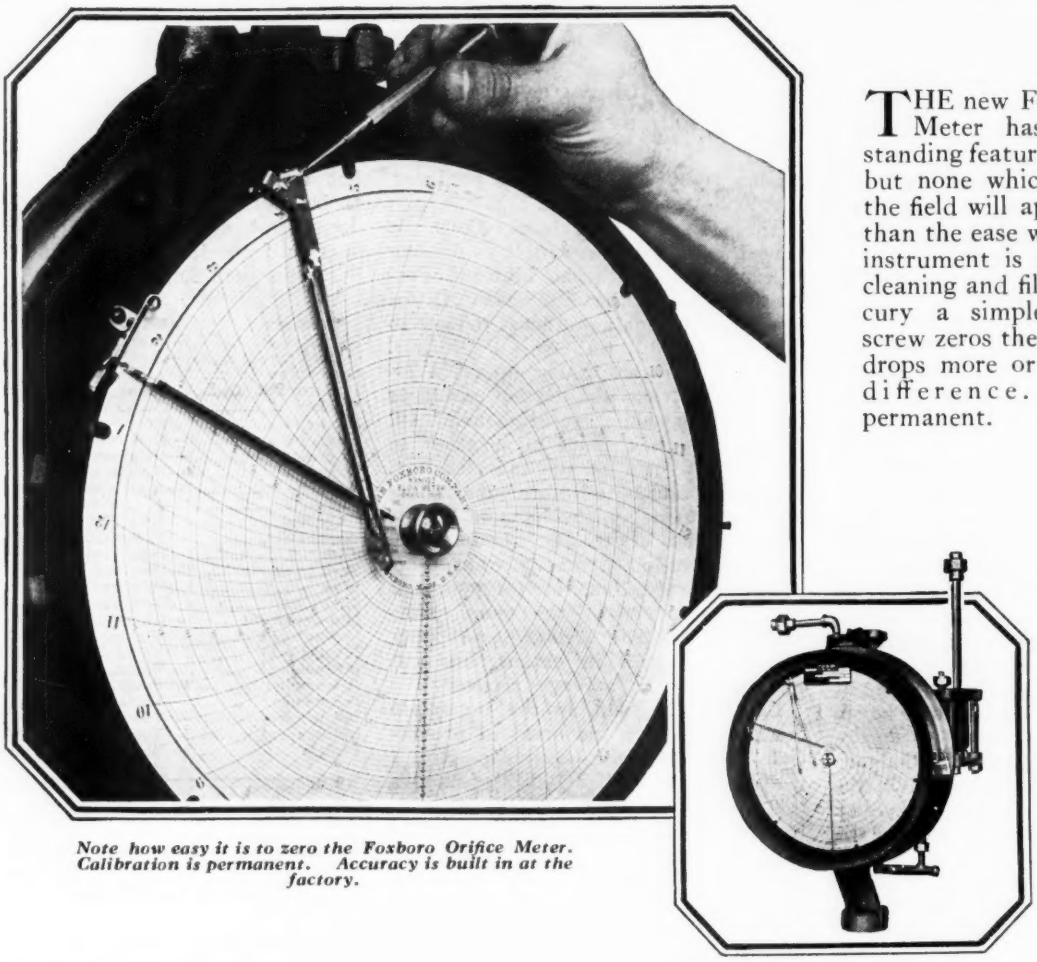
Two old wells in the Bowlegs field were drilled to the true Wilcox, but found water in both cases. This true Wilcox, known as the second Wilcox in the Seminole fields, is the sand which has caused all the commotion in the St. Louis area. In other respects the Seminole group did little out of the ordinary.

In the NE NW of 7-19N-7E, in an overlooked spot in the Oilton field, in eastern Creek county, Okla., the Silurian Oil Co. picked up a nice little producer in its No. 1 Clifford. The pay, from which is coming 600 barrels of oil daily, was topped at 3149 feet and drilled to 3151 feet. Although no samples of the pay had been examined, it is believed that the well is in the top of the Wilcox. A hard dolemitic sand was encountered from 3141-43 feet and a mixture of sand and lime from 4143 feet to the top of the pay.

Southeast of Okemah, in Okfuskee county, Okla., the Pure Oil Co. opened a pool in the Kingwood sand of the Deaner series. Located in the center of the NW NW of 25-11N-10E, the well had the sand from 3058 to 3073 feet. It is estimated to be good for 200 barrels daily.

Gray county, in the Texas Panhandle, turned in a couple of new producers during the week. The Plains Drilling Co. No. 1 Saunders,

EASY *to zero*



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in Sec. 4, Blk. 1, A. C. H. & B. Survey, is spraying oil from a pay found at 2620 feet. Casing is being run, and the Prairie Pipe Line is preparing to connect with the well.

The other well, a Gray county wildcat which had been shut down for a month, is showing signs of life. The test had been shut down after having been shot with 510 quarts of nitroglycerin in a sandy formation which had had a show of oil from 2775-2872 feet. The well is now cleaning out and swabbing six barrels per hour.

Rush county, in western Kansas has what is possibly a wildcat producer in the well drilled by Valerious et al. in the center of the NW of 27-17S-17W. There is 250 feet of 31 gravity oil in the hole from the top of the Oswald lime at 3321-41. There is no gas with the oil.

Deep Roberts-Settles Wells Produce Only on Pump

WITH the exception of the Henshaw Oil Corp.'s newly completed A-1 test, in Texas & Pacific Sec. 6, Block 32 township 1 south, virtually all deep lime wells in the Roberts-Settles area of Howard and Glasscock counties, West Texas, are being pumped.

Howard-Glasscock production approximates 25,150 barrels daily from 182 wells, of which 20 odd were drilled into the two deep lime horizons of the area. Around 160 of the wells produce from shallower sand levels of the so-called Chalk area, accounting for nearly 5000 barrels daily of the total yield.

The Henshaw A-1, which extended production between two and three miles west of earlier deep lime wells, was shut in after testing 4220 barrels, daily maximum, at total depth of 2232 feet.

Production in the Henshaw test was found at lime penetration of about 200 feet, as compared with 700 to 900 feet in other wells. As the drill was still in soft lime at present total depth it was reported from the field that the Henshaw well might be carried on down to test deeper possibilities, notwithstanding flowing results already obtained.

The Howard-Glasscock prorating order fixes the maximum of allowable production at 25,000 barrels daily, figured at 50 per cent of the potential as based on full 24-hour gages of well capabilities.

Wells were swabbed, agitated or flowed, according to their producing characteristics, at the time potential production gages were taken. Since that time they have been found incapable of producing similar quantities, in effect defeating proration but keeping the field within limits of the railroad commission order.

Almost complete absence of gas as a propulsive force, plus a lack of the natural water drive found in other West Texas salt basin fields, eliminated natural flow in most of the Howard-Glasscock county wells. Except for prorating test purposes and for use in completions of wells, prorating rules ban the use of swabbing and air/gas lift.

Pipeline outlets will soon greatly exceed the production possibilities of the area. Shell Pipeline Corp., and Magnolia Petroleum Co., both have spur lines from their West Texas trunk systems connecting with the territory; each capable of handling up to 10,000 barrels of crude daily.

Humble Pipeline Co. is completing an 8-inch line north from Kemper station, in Reagan county, a distance of 60-odd miles, and offers an outlet for about 10,000 barrels daily from the area. The Atlantic Pipeline Co.'s Midland-to-the-Gulf trunk system, which is expected to be completed by December, could be connected to the area by building a short spur.

Short pipeline facilities of the J. S. Cosden and the Reece S. Allen interests are nearing completion from the field to Big Spring, on the Texas & Pacific railroad, where refining plants are under construction. These will provide outlet for both controlled and purchased oil in the future.

CURRENT developments in other areas of the Permian salt basin region of West Texas and southeastern New Mexico are confined largely to the last named division.

In Lea county, New Mexico, the Gypsy Oil Co.'s No. 1 State-Ramsey test, in 34-21S-36E, got another gas pay at 3285-3290 feet, making 20,000,000 to 25,000,000 cubic feet daily. The tools were blown up the hole and the drilling line broken, delaying operations.

A spray of oil found with 6,000,000 cubic feet of gas at 3242 feet seems to have been exhausted. Surface elevation of the test is 3562 feet, making the Gypsy well one of the highest on the sub-surface lime ridge which is now being outlined approximately 30 miles into New Mexico from northernmost oil production in Winkler county, Texas.

Accepted correlations of formations drilled in the several holes place the Sholes, Lynn and Danciger tests of Marland Production Co. on the same general lime ridge as the Gypsy well. The Marland tests, in which the California Co. owns an interest, are located, respectively, in secs. 19-25S-37E, 26-23S-36E and 7-23S-36E.

The Skelly Oil Co.'s No. 1 Joyner, in 26-25S-36E, about two miles southwest of the Marland-Sholes, although structurally low as compared with the Sholes test, topped the train lime at 2990 feet and had a small show of oil a few feet in the lime.

NORTHEAST and northwest of the Gypsy well, oil was found in tests, respectively, of the Midwest Refining Co., and the Empire Gas & Fuel Co. It is impossible to say as yet, however, whether the oil produced from either well comes from a veering extension of the lime ridge, or whether complications of structure intervene between them.

The Empire well, in 8-21S-35E, pumped 230 barrels of oil and about 75 barrels of water daily from 3835 feet as late as the middle of September. The Midwest well, in 9-19S-38E, remains shut down for storage after producing about 13,000 barrels total at 4203 feet.

Other Lea county wells making oil shows include the Midwest's No. 1 Farnsworth, in 12-26S-37E, elevation 3010 feet, which tested 10 bailers of oil and a show of gas at 3463-3470 feet; The Texas Production Co.'s old Rhodes test, 22-26S-37E, which made about 23,000,000 cubic feet of gas and averaged 110 barrels daily of oil and distillate about two years ago; and The Texas Production Co.'s No. 1 Sheppard, 6-26S-37E, which had a trace of oil at 2885-2887 feet, surface elevation 2970 feet.

A second deep test in Reagan county, West Texas, is to be drilled to 10,000 feet, if necessary, in Sec. 1, University block 2, 330 feet from the north and east lines of the northeast quarter. It is being drilled by Big Lake Oil Co., which has already reached a depth of 2473 feet in lime formation.

The first deep test in Reagan county was the University B-1 of the Texon-Group 1 companies[1], in sec. 36, University block 9, last reported drilling in black lime at 8345 feet. This test is carrying oil in the hole from a pay found at roundly 6300 feet, occasionally accumulating sufficient pressure to cause "head" flows.

HOUSTON, Oct. 11.—Humble Pipeline Co.'s new terminal at Harbor Island, in the Corpus Christi district, has been completed at a cost of over $1,000,000. The first tanker to be loaded to capacity at the terminal was the S. S. John Worthington, 12,000 tons. The S. S. Barstow, 15,000 tons, was also loaded the same day.

Until completion of the terminal and deepening of the port it had been impossible to make capacity loadings. Now the depth of the port is 31 feet through the pass and 33 to 37 feet in the turning basin.

1—NATIONAL PETROLEUM NEWS, page 28, Aug. 29, 1928 and page 129, Sept. 5, 1928.

Sun Oil Co. Finds New Field

HOUSTON, Oct. 12.—Two discovery wells of Sun Oil Co., in the interior plains division of the Gulf coastal region, reached completion stages this week.

One, its No. 1 Grote, is on a solidly blocked salt dome structure in the Somerville area, about 10 miles north of Brenham, in Washington county. At 1155 feet, the Grote began making 28 A. P. I. gravity oil by heads. It is rated a commercial well, good for at least 200 to 300 barrels daily, perhaps more. The Sun block consists of about 7000 acres.

The Sun's other discovery ushered into being the second Edwards lime field of Caldwell county, about six miles south-southeast of Luling production, on an *en echelon* faulted-fold. It topped the Edwards lime at 2707 feet and flowed 1-minute heads every 1½ minutes at 2734 feet. Afterwards it made 270 barrels in seven and a half hours on swabbing test.

Geological data based on surface bedding in relation to the high position of the Edwards at the Sun's location on the Malone farm, in the A. Floyd survey, indicates the main producing area lies east-northeast in the so-called "Salt Flats." There major companies have the acreage tied up in leaseholds previously taken. Humble Oil & Refining Co., both on its own account and in partnership with Luling Oil & Gas Co., owns a majority of the leaseholds.

Another field comparable with Luling is believed by geologists to have been discovered, the second to produce from the Edwards in a fault zone subsidiary to the major Balcones fracture.

Luling produced between 45,000 and 50,000 barrels, daily average, at its maximum. The "shoestring" producing area consisted of between 1500 and 2000 acres. Ultimate recovery at Luling is estimated on well performance and decline curves at more than 50,000,000 barrels.

Roxana's First Well In Indiana

INDIANAPOLIS—Roxana Petroleum Corp.'s first entry into the producing fields of Indiana was a well good for 30 to 35 barrels daily. It is in Sec. 22, Columbia township, Gibson county, about three miles west of Oakland City. The well made five million feet of gas at 1413 feet and when deepened to 1422 found the oil. Some new territory is proved by this test and Roxana will drill another at once.

New High Gravity Pool Found Near Coleman

HOUSTON, Oct. 12.—New territory a mile and a half from production in central Coleman county was opened when the No. 1 Overall test, seven miles southwest of the town of Coleman, was completed for 723 barrels of 41.3 A. P. I. gravity oil at 2116-2118 feet.

The well, in the southwest corner of J. H. Berkley survey No. 700, belongs jointly to Atlantic Oil Producing Co., the Continental Oil Co., Midsun Oil Corp., Anzac Oil Corp., and M. G. Cheney.

It is in the shallow sand region which fringes the general Ranger deep lime territory on the west and southwest.

Commercial Well Near Abilene

HOUSTON, Oct. 11.—Although its owners are making a deeper test of the No. 1 Reynolds Cattle Co. well in the J. Fenner survey, the Moody Oil Corp. of Houston has already acquired the distinction of producing the first commercial oil in Haskell county, northwest of Abilene.

At 1727 feet the well averaged three barrels an hour of 37 A. P. I. gravity crude. Nearest production is in the Cook ranch pool, 15 miles southeast, developed by Roeser & Pendleton, Inc., for the joint account of itself and Marland Production Co.

Pipeline Royalty For Texas U.

HOUSTON, Oct. 12.—The University of Texas was placed in an unique position by a court order entered at Austin, Oct. 12, giving it a royalty interest in the operation of the Reagan County Purchasing Co.'s pipeline facilities serving the Big Lake field. This is probably the first time in the history of the oil industry such a royalty has been paid.

The Big Lake field, on University of Texas acreage, was developed in its entirety by the Big Lake and Texon-Group 1 companies. They are also 49 per cent owners of the Reagan County Purchasing Co., formed as a part interest subsidiary of the Marland Oil Co. to handle a 20,000 barrels daily crude contract for the life of the field.

Crude covered by that contract was afterward turned to Humble Oil & Refining Co., the Reagan county corporation profiting from operations of its gathering lines from the Big Lake wells to the Humble's concentration base about 15 miles away. A 20 cents a barrel gathering and transportation tariff was applied.

The present agreed judgment calling for payment of $1,000,000 in cash and adjusted royalties that may add another $500,000 to the university fund results from a suit pending the last two years against interested companies. It was brought by the state, which asked an accounting on behalf of the university.

The Big Lake contract is based on an average of the posted price of five principal Mid-Continent purchasers, for 38 gravity oil, which nets both the University and the operators approximately double the price for their production that obtains in other west Texas sulfur crude fields.

Of the $1,000,000 paid under the agreed judgment, $950,000 goes to the university's permanent fund and $50,000, representing interest accrued to Oct. 1, 1928, will reach the available building fund.

Seminole District Production by Companies and Leases, October 10 and October 3, 1928

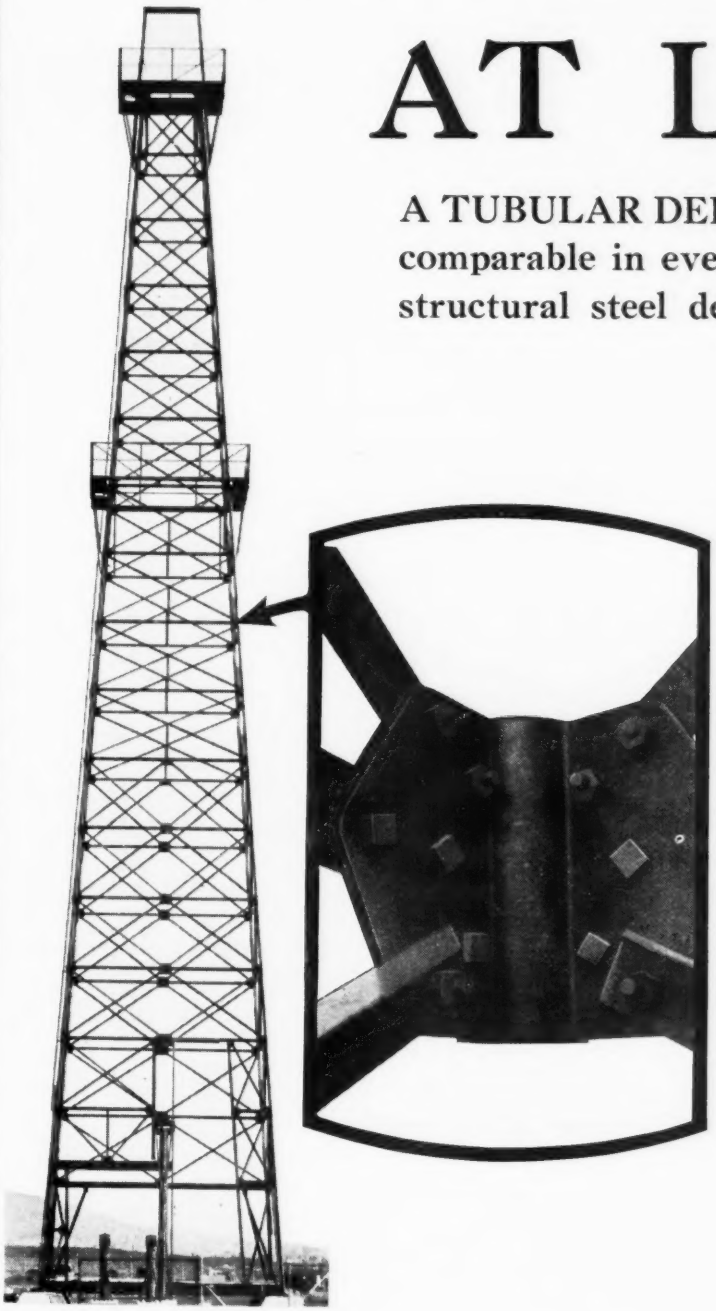
LITTLE RIVER

Company	Farm	S.T.R.	Oct. 10 Wells	Oct. 10 Prod.	Oct. 3 Wells	Oct. 3 Prod.
Amerada	Nitey	2- 7-6	3	1,100	3	1,225
Amer-Wilcox	Fore	35- 8-6	1	290	2	300
Total Amerada			5	1,390	5	1,525
Barnsdall	Cotcha	23- 7-6	2	2,062	2	2,537
Barnsdall	Hotulke	22- 7-6	2	583	2	669
Barnsdall	Walker	4- 7-6	1	235	1	572
Total Barnsdall			5	2,880	5	2,537
Blackwell	Baker	11- 7-6	4	2,795	3	2,035
Blackwell	Nitey	35- 8-6	6	1,656	6	1,840
Blackwell	Talley	14- 7-6	3	1,215	3	1,335
Total Blackwell			13	5,666	12	3,210
Carter	Cotcha-M	23- 7-6	3	160	1	73
Carter	Cudjo	23- 7-6	1	20	1	55
Carter	Fish	36- 8-6	4	595	4	535
Carter	Harjo-C	11- 7-6	1	6,565	1	6,790
Carter	Harjo-M	13- 7-6	2	1,270	2	1,349
Carter	Jackson	11- 7-6	3	1,835	3	1,950
Carter	Larney	24- 7-6	2	1,637	2	1,721
Carter	Lena	10- 7-6	1	1,411	1	1,531
Carter	Moore	11- 7-6	2	1,402	1	890
Carter	Tewee	14- 7-6	5	5,402	5	5,024
Carter	Thomas	11- 7-6	2	592	2	603
Carter	Wilson	12- 7-6	1	940	1	940
Total Carter			27	21,829	24	21,561
Champlin	Tewee	14- 7-6	2	2,500	2	2,815
Continental	Cosar L	36- 8-6	7	2,310	7	2,140
Continental	Cosar M	25- 8-6	1	275	1	385
Cont. et al.	Milsey	11- 7-6	1	2,185	1	2,350
Total Continental			9	4,770	9	4,875
Empire	Coker	13- 7-6	1	407	1	470
Gypsy	Brown C	33- 8-6	2	985	2	1,157
Gypsy	Brown M	33- 8-6	1	1,117	1	1,050
Gypsy	Campbell	33- 7-6	2	67	2	67
Gypsy	Conard	22- 7-6	2	1,135	2	1,327
Gypsy	Cosar M	25- 8-6	1	0	1	0
Gypsy	Cosar W	35- 8-6	2	322	2	360
Gypsy	Cotcha	23- 7-6	4	2,187	4	2,662
Gypsy	Denmark	11- 7-6	2	3,342	4	3,485
Gypsy	Hulhoke	14- 7-6	10	7,410	10	8,177

(*Continued on Page 60*)

AT LAST—

A TUBULAR DERRICK with end fixation comparable in every respect with that of structural steel derricks.

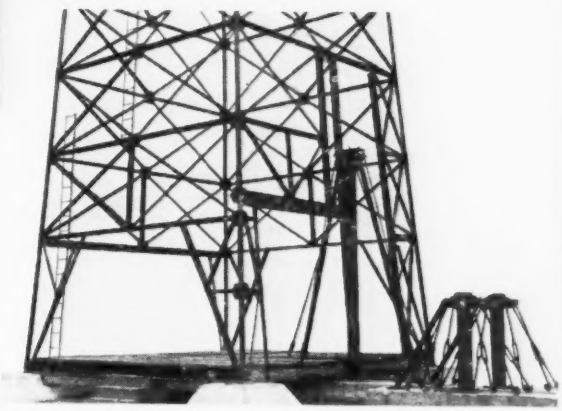


122'-0 x 24'-0 x 5'-6" 4" tubular rotary derrick.

Angle iron girths and braces, .40-.50 carbon seamless steel legs in all types of Wertzberger derricks. The best derrick clamp ever devised permits the heaviest construction, and affords the strongest braced derrick on the market. Same diameter bolts are used throughout.

Two of these new Wertzberger derricks will be shown at the 5th International Petroleum Exposition, October 22nd to 29th, Tulsa, Okla. The 122 foot rotary will be in operation on the National Supply Company space, and an 80 foot heavy driller at the Exposition well.

LOOK FOR THE YELLOW DERRICKS



View of the Fraser pipe front, manufactured and sold by Wertzberger Derrick Co.

WERTZBERGER DERRICK COMPANY

Tulsa, Oklahoma

Seminole District Production by Companies and Leases, October 10 and October 3, 1928

(*Continued from Page 58*)

Company	Farm	S.T.R.	Oct. 10 Wells	Oct. 10 Prod.	Oct. 3 Wells	Oct. 3 Prod.
Gypsy	Mungee	1- 7-6	1	23	1	22
Gypsy	Pottie	35- 8-6	4	1,027	4	817
Gypsy	Renton	11- 7-6	3	997	3	1,085
Total Gypsy			34	18,612	36	20,209
Independent	Davis R	13- 7-6	2	940	2	910
Indep.	Tewee	14- 7-6	4	2,942	4	3,472
Indep. et al.	Harris	23- 7-6	8	3,707	8	4,063
Indep. W. Eagle	Davis	3- 7-6	4	745	3	990
Indep.	Williams	15- 7-6	1	1,235	1	1,370
Total Independent			19	9,569	18	10,805
I. T. I. O.	Campbell	1- 7-6	1	216	1	200
I. T. I. O.	Dungan	35- 8-6	3	1,188	3	1,194
I. T. I. O.	House MA	1- 7-6	1	41	1	20
I. T. I. O.	House WE	1- 7-6	1	48	1	39
I. T. I. O.	House B	2- 7-6	4	898	4	807
I. T. I. O.	Hull	26- 8-6	3	673	3	775
I. T. I. O.	Jackson	1- 7-6	3	915	3	839
I. T. I. O.	McCulla	1- 7-6	3	570	3	597
I. T. I. O.	Nitey	1- 7-6	6	221	6	173
I. T. I. O.	Phoebe A	36- 8-6	3	285	3	269
I. T. I. O.	Phoebe B	36- 8-6	4	176	4	199
I. T. I. O.	Reed	1- 7-6	1	32	1	16
I. T. I. O.	Sohetheche	1- 7-6	3	629	3	613
Total I. T. I. O.			36	5,892	36	5,741
Magnolia	Cruse	2- 7-6	4	1,000	4	990
Magnolia	Denby	11- 7-6	2	1,088	2	1,160
Magnolia	Dixon	31- 8-7	1	3	1	2
Magnolia	Harjo A	14- 7-6	2	765	2	695
Magnolia	Harjo B	14- 7-6	2	1,168	2	1,296
Magnolia	Pottie	35- 8-6	4	585	4	672
Magnolia	Reed	22- 7-6	3	1,460	3	1,464
Total Magnolia			18	6,069	18	6,279
Mid-Continent	Bruner	11- 7-6	4	2,515	4	2,920
Mid-Continent	Eleck	23- 7-6	1	450	1	660
Mid-Continent	Smith	5- 7-6	1	1,595	1	1,615
Mid-Continent	Wadsworth	36- 8-6	7	210	7	540
Total Mid-Continent			13	4,770	13	5,735
W. B. Pine	Hoyecha	26- 8-6	5	2,430	5	2,185
Pine-Phillips	Pottie	35- 8-6	2	477	2	390
Total Pine			7	2,907	7	2,575
Prairie	Chilcoat	25- 8-6	3	905	3	830
Prairie	Dungan	36- 8-6	1	35	1	30
Prairie	Gibson	14- 7-6	6	4,065	5	3,340
Prairie	Harris	14- 8-6	3	1,465	3	2,095
Prairie	House	2- 7-6	4	525	4	500
Prairie	Moppin	24- 7-6	1	650	1	740
Prairie	Talley	14- 7-6	4	2,536	3	2,050
Prairie-Amer.	Sunny	14- 7-6	8	5,835	7	8,175
Total Prairie			000	00.000	0	00.000
Pure	Cotcha	14- 7-6	9	5,914	6	3,594
Pure	Harjo	11- 7-6	4	1,249	3	0
Total Pure			13	7,163	9	3,594
Reiter-Foster	Bunyard	14- 7-6	4	3,590	4	3,750
Roxana	Caesar	11- 7-6	1	0	1	89
Roxana	Hotulke	23- 7-6	4	1,656	4	1,722
Roxana	Johnson	13- 7-6	3	2,655	2	2,793
Total Roxana			8	4,311	7	4,608
Shaffer	Narcome	36- 8-6	2	230	2	270
Sinclair	Cosar	36- 8-6	3	1,150	3	965
Sinclair	Haney	12- 7-6	1	130	1	135
Sinclair	Pompey	24- 7-6	1	445	0	0
Sinclair	Tewee	14- 7-6	2	2,420	2	2,015
Total Sinclair			7	4,155	6	3,115
Skelly	Carl	14- 7-6	2	2,641	2	2,835
Slick	Reed	13- 7-6	1	1,150	1	0
Slick	Williams	15- 7-6	2	960	2	1,158
Total Slick			3	2,110	3	1,158
Snowden et al.	Tiger	13- 7-6	3	1,224	3	1,422
Superior	Soketheche	1- 7-6	1	0	1	10
Texas	Brooks	25- 8-6	1	185	1	230
Texas	Coker	1- 7-6	3	615	3	695
Texas	Janey	11- 7-6	2	1,265	2	1,585
Tex-Indep.	Hotulke	23- 7-6	2	1,180	2	1,475
Total Texas			8	3,245	8	3,985
Tidal	House	1- 7-6	3	495	3	530
Tidal	Johnson	1- 7-6	1	30	1	30
Total Tidal			4	525	4	560
Twin State	Lowe	25- 8-6	1	135	1	135
TOTAL LITTLE RIVER			277	132,585	264	135,918

EARLSBORO

Amerada	Anderson	15- 9-5	2	571	2	581
Amerada	Cowden	4- 9-5	7	1,232	7	1,244
Amerada	Rogers	3- 9-5	2	107	2	51
Total Amerada			11	1,910	11	1,876
Atlantic et al.	Foreman	18- 9-5	1	140	1	135
Barnsdall	Brown	10- 9-5	4	1,867	4	1,741
Barnsdall	F. Bruner	2- 9-5	3	321	3	594
Barnsdall	Bruner	10- 9-5	3	1,199	3	1,135
Barnsdall	Cudjo	14- 9-5	1	23	1	23
Barnsdall	D. Davis	11- 9-5	3	221	3	319
Barnsdall	J. Davis	11- 9-5	4	1,194	4	1,306
Barnsdall	M. Davis	11- 9-5	2	57	2	69
Barnsdall	Gibson	9- 9-5	8	1,738	8	2,173
Barnsdall	Hern	15- 9-5	1	2	1	1
Barnsdall	Ingram	1- 9-5	8	1,073	8	1,074
Barnsdall	Pack	10- 9-5	4	165	4	177
Barnsdall	Peter	10- 9-5	4	91	4	99
Barnsdall	Sango	1- 9-5	4	2,147	4	2,511
Barnsdall	Sebolka	15- 9-5	1	216	1	292
Barnsdall	H. Sullivan	11- 9-5	1	0	1	31
Barnsdall	Sull-Harjo	10- 9-5	2	28	2	53
Barnsdall	Watsutke	12- 9-5	4	1,030	4	982
Total Barnsdall			57	11,372	57	12,580
Burk Greis	Wisner	6- 9-6	1	1,260	1	1,395
Carter	Davis	13- 9-5	2	25	2	225
Carter	James	6- 9-5	3	4,880	3	5,567
Carter	Sango	1- 9-5	3	30	3	40
Total Carter			8	4,935	8	5,832
Continental	Kays	2- 9-5	2	95	2	5
Continental	Spencer	12- 9-5	4	1,265	4	1,305
Total Continental			6	1,360	6	1,308
Empire	Barker	12- 9-5	1	72	1	80
Empire	Edmundson	3- 9-5	3	168	3	138
Total Empire			4	240	4	218
Gypsy	Bruner	10- 9-5	4	3,450	4	3,545
Gypsy	B. Carter	11- 9-5	8	3,935	8	3,210
Gypsy	Earl	16- 9-5	1	18	1	13
Gypsy	Hunick	6- 9-5	1	2,007	1	1,975
Gypsy	Noble	12- 9-5	4	2,062	4	1,805
Gypsy	Peter	10- 9-5	3	257	3	330
Gypsy	Sango	1- 9-5	11	5,347	11	5,647
Gypsy	State	16- 9-5	4	1,232	4	1,140
Total Gypsy			35	18,308	36	17,665
Independent	Bruner	10- 9-5	3	182	3	442
Independent	Sullivan	10- 9-5	1	20	1	20
Independent	Knapp	8- 9-5	3	1,380	3	1,382
Indep.-Margay	Gaines	11- 9-5	3	590	3	560
Total Independent			10	2,172	10	2,404
Magnolia	Bryant	9- 9-5	6	442	6	436
Magnolia	Cowden	4- 9-5	4	30	4	30
Magnolia	Dixon	12- 9-5	1	25	1	25
Magnolia	Edmundson	3- 9-5	3	15	3	20
Magnolia	Holmsley	11- 9-5	7	661	7	947
Magnolia	Hyde	13- 9-5	1	1,560	1	1,568
Magnolia	Ingram	10- 9-5	1	15	1	16
Magnolia	Lena	10- 9-5	3	45	3	44
Magnolia	Seay	12- 9-5	9	2,608	9	2,577
Magnolia	Simpson	10- 9-5	4	502	4	536
Magnolia,	Sparks	11- 9-5	7	848	7	904
Magnolia	Sullivan	12- 9-5	3	72	3	50
Total Magnolia			49	6,823	49	7,153
Mid-Cont.	McCumber	9- 9-5	7	90	7	90
Mid-Kansas	Anderson	14- 9-5	3	65	3	15
Phillips	Dunnaway	14- 9-5	1	27	1	27
Prairie	Baker	24- 9-5	1	50	1	50
Prairie	Davis	13- 9-5	4	2,885	4	2,955
Prairie	C. Graham	3- 9-5	2	25	2	30
Prairie	O. Graham	10- 9-5	4	1,200	4	1,195
Prairie	Stidham	11- 9-5	12	2,170	12	2,195
Total Prairie			23	6,823	23	6,425
Roxana	Bayliss	17- 9-5	1	20	1	14
Roxana	Hearn	13- 9-5	1	127	1	117
Roxana	Spencer	12- 9-5	2	1,492	2	1,506
Total Roxana			4	1,639	4	1,637
Shaffer	Clark	1- 9-5	3	200	3	376
Shaffer	McCoy	36-10-5	1	1,142	1	1,190
Total Shaffer			4	1,342	4	1,566
Sinclair	Foreman	18- 9-5	1	14	1	14
Sinclair	Hollins	12- 9-5	1	45	1	50
Sinclair	Sango	2- 9-5	4	3,000	4	3,225
Total Sinclair			6	3,059	6	3,289
Skelly	Mays	1- 9-5	1	3,173	1	3,513
Skelly	Shephard	6- 9-6	1	1,560	1	1,660
Skelly	Sherry	6- 9-6	2	1,667	2	925
Skelly	Spencer	12- 9-5	1	375	1	415
Total Skelly			4	6,775	4	6,513
Superior	Ingram	1- 9-5	1	759	2	642
Superior	Walker	2- 9-5	3	3,096	3	3,058
Total Superior			4	3,855	5	3,700
Texas	Anderson	2- 9-5	8	400	8	410
Texas	Brown	10- 9-5	8	482	8	395
Texas	James	6- 9-6	1	685	1	690
Texas	Rogers	5- 9-5	4	2,500	4	2,515
Texas	Wilmott	10- 9-5	7	710	7	775
Total Texas			28	4,717	28	4,785
Tidal	Walker	36-10-5	1	2,135	1	2,260
Tidal	Watkins	9- 9-5	7	2,625	7	2,745
Total Tidal			8	4,760	8	5,005
Twin State	Barker	12- 9-5	3	53	3	53
Twin State	Hern	2- 9-5	4	245	4	220
Total Twin State			7	298	7	273

SUMMARY

	Oct. 10 Wells	Oct. 10 Prod.	Oct. 3 Wells	Oct. 3 Prod.
TOTAL EARLSBORO	**284**	**81,537**	**285**	**83,893**
TOTAL BOWLEGS	**314**	**51,376**	**315**	**53,954**
TOTAL SEMINOLE	**287**	**42,851**	**287**	**46,080**
TOTAL SEARIGHT	**69**	**11,676**	**69**	**11,629**
TOTAL LITTLE RIVER	**277**	**132,585**	**264**	**135,918**
GRAND TOTAL SEMINOLE AREA	**1,231**	**320,025**	**1,220**	**331,474**
Average per well			**260**	**271**

Completions in Texas, Week Ended October 13, 1928

NORTH EAST CENTRAL TEXAS

Anderson County

Company	Well Farm	Survey	Sec. & Blk.	Depth	Initial Prod.
Humble	2-Jones	Roberts		3665-3690	62&10M

Brown County

Humble	24-Hickman	Benson Blk-783		1260-1261	5
Kerr et al	2-Boyson	Mullens		1764-1784	3M
Kone Prod	16-Hickman	Benson Blk-783		1228-1245	20
Young Bros. et al.	12-Hickman	Benson Blk-783		1239-1254	100
Cox-Drake	1-Culberson	ET Sec-4		T.D. 1603	Dry
Gilman et al	5-Hickman	Benson Blk-783		T.D. 1290	Dry
Mitchem et al	1-Keeler	Kenney Blk-624		T.D. 1062	Dry

Coleman County

Humphreys et al	2-Mathews	Raguet Blk-43		1851-1911	25
Continental	8-Overall	Overall Blk-66		755-757	3M
Ilsing Prod	1-Eddington	Victoria Co. Sch. Ld. Sec-28 Blk-187		1119-1127	2M
Kingwood	2-McCord	BBB&C Blk-41		T.D. 4045	Dry
Bradstreet et al	1-Wheatley	Manson Sec-11 Blk-80		T.D. 2200	Dry

Eastland County

Republic Prod	4-Sneed	McLennon Co. Sch. Ld. Sec-30		1202-1212	15

Jack County

Ellis et al	10-Fee	Williams Blk-4		T.D. 565	Dry

NORTH TEXAS

Archer County

Brown et al	1-Wallace	DCSL League-3 Blk-11		1015-1024	17
Madden et al	3-Richardson	SAR Blk-1		1296-1300	80
Rathke	5-Andrews	Spavin	Abst-371	T.D. 1600	Dry
Wichita Prod. et al.	1-Richardson	Anderson Blk-1		T.D. 1410	Dry
Texas	5-Hayter	TEL Sec-2409		T.D. 1422	Dry
Golding et al	1-Graham	Smell	Abst-386	T.D. 1552	Dry
Burns-Long	1-Cernosek	TE&L Sec-2409		T.D. 1442	Dry

Cooke County

Flesher	1-Jones	Hill Abst-462		T.D. 1600	Dry

Wilbarger County

Kolp	1-Waggoner	H&TC Sec-8 Blk-4		T.D 2750	Dry
Hester-Hawkins et al.	1-Waggoner	H&TC Sec-36 Blk-14		T.D. 1300	Dry
Hampton et al	2-Waggoner	Purnell		T.D. 1927	Dry
Golding et al	1-Waggoner	H&TC Sec-33 Blk-4		T.D. 2601	Dry
Knotts et al	1-Badgett	Farmer		T.D. 250	Dry
Waggoner Ref.	10-Waggoner	H&TC Sec-24 Blk-4		T.D. 2430	497
Texas	13-Waggoner	H&TC Sec-24 Blk-4		2361-2392	753
Hamilton et al	5-Waggoner	H&TC Sec-5 Blk-5		1849-1891	218
Fain-McGaha	1-Waggoner	H&TC Sec-32 Blk-4		1830-1838	34
Consolidated	12-Waggoner	H&TC Sec-5 Blk-5		1859-1880	35
Barkley-Meadow	5-Waggoner	H&TC Sec-5 Blk-5		1883-1890	78
Baker et al	4-Waggoner	Baker Abst-3		1910-1912	35
Baker et al	5-Waggoner	Purnell Abst-461		1874-1886	314

Young County

Wolfe	5-Lowe	TE&L Sec-59		T.D. 896	Dry
Shappell	4-Garrett	TE&L Sec-1487		T.D. 851	Dry
Kennedy et al	1-Johnson	Sergeant		T.D. 600	Dry
Halsell	1-Marshall	TE&L Sec-617		T.D. 844	Dry
Albright et al	1-Swain	TE&L Sec-1465		T.D. 745	Dry
Cooper et al	1-Parish	TE&L	Sec-409	1089-1099	46
Tidal	3-Garrett	TE&L Sec-1487		556-560	20
Kennedy et al	1-Johnson	Sergant Blk-11		500-510	36
Riggs	16-McKinley	TE&L Sec-1489		561-576	26
Riggs	15-McKinley	TE&L Sec-1489		579-579	30
Perkins et al	4-Gregg	Rohus Abst-240		779-816	5
Mook-Tex	8-Davis	TE&L Sec-1487		539-564	25
Kleiner et al	25-Langston	TE&L Sec-1490		533-568	40
Baller	8-Gregg	Rohus Sec-240		731-770	20

PANHANDLE

Carson County

Anderson et al	1-Turney	I&GN Sec-50 Blk-7		T.D. 3628	Dry
Ross	1-Barnard	I&GN Sec-24 Blk-4		T.D. 3625	Dry

Gray County

Empire	1-Hefter	H&GN Sec-215 Blk-B-2		2775-3356	11M
Parker et al	2-Parker	Lynch		T.D. 2880	Dry
Holbrook et al	1-Williams	ACHTB Sec-15 Blk-1		T.D. 3330	Dry
Delaney et al	5-Jackson	H&GN Sec-88 Blk-B-2		T.D. 3335	Dry

Hutchinson County

Phillips	7-Dorsett	H&TC Sec-64 Blk-46		2682-2727	100
Phillips	17-Martin	HTDB Sec-1 Blk-402		2850-2952	60

WEST TEXAS

Crane County

Chruch-Weekley et al.	2-Lassetter	Univ. Sec-34 Blk-30		2924-3012	350
Gulf Prod	52-McElroy	CCSD Sec-201 Blk-F		2790-2900	450

Glasscock County

Merryweather et al.	1-McDowell	T&P Sec-34 Blk-34		T.D. 3905	Dry

Howard County

Amerada	1-Stewart	W&NW Sec-130 Blk-29		T.D. 3209	Dry
Magnolia	8-Roberts	W&NW Sec-136 Blk-29		2970-3000	1485
Cosden	3-Roberts	W&NW Sec-129 Blk-29		3050-3074 (19½ Hrs.)	1730

Martin County

Phillips	1-Slaughter	Bauer et al. Sec-77		T.D. 4450	Dry

Midland County

Schoup et al	1-Parks	T&P Sec-31 Blk-45		T.D. 4005	Dry

Motley County

Exploration	4-Matador	WT Sec-21 Blk-0-2		T.D. 4015	Dry

Pecos County

Vacuum	1-Ellsmore	GC&SF Sec-60 Blk-D		T.D. 4480	Dry
California	17-Yates	TC	Sec 34 Blk-194	1025-1283	321
California	18-Yates	TC Sec-34 Blk-194		1265-1388 (30 Min.)	1236

Upton County

Cordova Union	1-Fee	GC&SF Sec-4		T.D. 2210	Dry

Winkler County

Bolin	1-Brown et al.	PSL Sec-4 Blk-B-5		2755-2814	8
Independent	2-Howe	PSL Sec-44 Blk-26		2883-2926	336
Independent	7-Dardeman	PSL Sec-41 Blk-B-5		T.D. 2765	200
Roxana-Texas	4-Grisham	PSL Sec-45 Blk-26		2815-2958	350
Republic Prod	4-Hendricks	PSL Sec-42 Blk-B-5		2792-2860	198
Roxana	1-Hendricks	PSL Sec-39 Blk-26		2809-3244	107
Southern Crude	T88M22-Hendricks	PSL Sec-33 Blk-26		2859-2860	325
Texon	5-Hendricks	PSL Sec-41 Blk-B-5		2760-2762	150
Roxana et al	3-Scarborough	PSL Sec-2 Blk-C-23		T.D. 3490	Dry
Sheldon et al	1-Hendricks	PSL Sec-28 Blk-B-5		T.D. 3243	Dry

Completions in North Louisiana and Arkansas, Week Ended October 11, 1928

Lousiana—Webster Parish—Shongaloo

Company	Well	Location	Depth	Yield
Magnolia Pet. Co.	R. J. Munn No. 2	29-23-9	2697	4M gas

Caddo Parish—Vivian

Bayou State Oil Co	Hoss No. 33	24-22-15	1050	20 bbls.

Caddo Parish—Pine Island

J. W. Burton	Church No. 1	1-20-16	812	110,000 ft. gas

Bossier Parish—Elm Grove

C. W. Jones	Meyer No. 1	31-16-11	2608	salt water, abd.

Morehouse Parish

Texas Company	Meyers No. 1	15-22-7E	2939	salt water abd.
Consol. Car. Co.	Perry No. 2	14-20-4E	2173	14M gas

Ouachita Parish

Nat. Gas & Fuel Corp.	McEnery No. 1	20-19-4E	2194	4M gas

Richland Parish

Company	Well	Location	Depth	Yield
S. D. Hunter	McCoy B-3	21-16-6E	2428	15M gas

Arkansas—Johnson County

Arkansas Nat. Gas Corp.	Kerwin No. 1	16-10-24	3361	4½M gas

Chicot County

Texas Company	Hammond No. 1	23-17-2	3496	dry, aband.

Union County—Rainbow City

E. C. Johnston, Tr.	Gregory No. 2	10-17-14	3286	20 bbls.
Magnolia Pet. Co.	Carroll No. 2	1-17-14	3007	110 bbls.
Ohio Oil Co.	Crain No. 8	1-17-14	3005	416 Bbls.
Ohio Oil Co.	Kate Townsend No. 1	10-17-14	3294	dry, aband.
Ohio Oil Co.	C. B. Nash No. 1	6-17-13	3044	690 bbls.
Marine Oil Co.	Sample No. 1	7-17-13	3027	1,500 bbls. 20M gas

Completions in California, Week Ended October 10, 1928

Long Beach

Company	Well No.	Location	Depth	Init. Prod.
General Petroleum	Boyle-Perry 7	.....	6500	73
O'Donnell, J. E.	No. 40	.....	5800	250
Richfield	Booth 11	.....	6375	51
Richfield	Dennie 8	.....	7210	268
Shell Co.	Alamitos 34	.....	6266	4400
Shell Co.	Nesa 8	.....	7316	1560

Ventura Avenue

Associated	Lloyd 56	.....	7027	2250

Rincon

C. C. M. O.	C 5 Hobson	.....	3808	616

Drilling Operations in Oklahoma, Kansas and Texas, Week Ended October 13, 1928

	Oct. 13 Loc.	Rigs	Drg.	S.D.	Week Ended Total	Oct. 6, 1928 Loc.	Rigs	Drg.	S.D.	Total
OKLAHOMA										
Osage	2	8	21	2	33	3	6	27	1	37
Bristow-Cushing	3	7	37	4	51	4	5	33	7	49
North Oklahoma	6	2	47	26	81	7	3	43	27	80
South Oklahoma	10	10	73	26	119	10	7	82	21	120
Muskogee	..	8	46	28	82	..	9	41	25	75
Okmulgee-Bris.	9	31	72	22	134	10	33	69	24	136
Seminole Dist.	23	83	262	69	437	17	82	266	65	430
Total Oklahoma	53	149	558	177	937	51	145	561	170	927
KANSAS	...	*69	203	58	330	*71	...	200	58	329

	Oct. 13 Loc.	Rigs	Drg.	S.D.	Week Ended Total	Oct. 6, 1928 Loc.	Rigs	Drg.	S.D.	Total
TEXAS										
Central	54	36	246	123	459	43	17	125	98	283
Panhandle	12	31	93	53	189	8	31	85	61	185
N. Central	32	33	117	43	225	30	31	123	38	222
West	67	32	206	148	453	58	29	231	130	448
Total Texas	165	132	662	367	1,326	139	108	564	327	1,138
New Mexico	3	6	26	14	49	4	6	25	14	49
GRAND TOTAL	221	356	1,449	616	2,642	265	259	1,350	569	2,443

*Location and rigs combined.

Completions in Oklahoma and Kansas, Week Ended October 13, 1928

OKLAHOMA

Carter County

Company	Well No.	Location	Depth	Init. Prod.
Hall-Briscoe	3	NEc SW 29-1-3 W	3058-3064	80
Schermerhorn et al.	1	NE NW SW 23-1S-3W	2307-2558	50

Creek County

Shaffer	1	NEc SE SE 34-16-10 E	3026-2040	40
Collins	1	SWc NE SE 26-10-11 E	1660-1672	10
Wilson et al	2	NEc 1-15-10	T.D. 3200	Dry
Indep	2	NEc NW 30-17-10	T.D. 3050	Dry
Dedman et al	1	SWc NE NE 13-17-9	T.D. 3068	Dry

Grady County

Okla. Gas Utilities	13	SE NW SW 26-5-8 W	2009-2394	31M

Grant County

Croxton et al	1	NWc 26-26-3 W	T.D. 4311	OWD Dry

Jefferson County

McGinley et al	7	NEc NW NW NE 20-7-5 W	761-690	12

Kay County

McComas	1	NWc SW SE SE 1-28-1 W	790-793	1.M
Ewing et al	1	NEc SE NE SE 28-28-2 E	T.D. 656	Dry

Logan County

Roxana	2	NWc SW 29-19-4 W	6067-6082	22

Muskogee County

Babcock Bros	2	CEL SW NE 8-15-15 E	1584-1585	20
Dixon et al	6	NWc NE NW NW 12-14-18 E	T.D. 966	Dry

Okfuskee County

Tidal	1	NWc SW SW 14-10-8 E	T.D. 4357	OWD Dry
Atlantic	1	NEc NW 7-10-12 E	2849-2860	OWD 20
Jarvis et al	1	SWc SE 16-10-11 E	1625-1707	40
Barnsdall	1	NW SE SW 15-10-9 E	3050-3074	OWD 3M

Okmulgee County

McInturff	1	CNL SW NE 8-13-14 E	1291-1300	6
Selby	9	C NW NW 6-14-15 E	630-652	20
Kirkland et al	1	SWc SE SW NW 19-15-13 E	1542-1602	10
Rebold	4	CSL N½ SE SW 30-15-11 E	2535-2570	15

Osage County

I. T. I. O	337	NE SE SE 34-25-11 E	1667-1686	.5M
Minnehoma	2	CWL SE 11-26-8 E	2235-2251	35
Lewis Prod	2	NW NE NE 22-26-6 E	2941-2989	200
Mid-Co	4	NW SW SW 25-27-11 E	1015-1050	10
Phillips	11	NE SW SE 17-27-6 E	2807-2955	40
Rex-Pyramid	41	SWc NE 34-22-10	T.D. 2400	Dry
Marland	1	NEc SW 18-26-6	T.D. 2915	Dry

Pawnee County

Turner et al	2	SWc SE SE NE 30-20-9	T.D. 1390	Dry

Payne County

Gardner	1	NEc SE 12-19-1 W	T.D. 4910	Dry

Pontotoc County

Ogg Petroleum	1	SE SW SW 29-5-5 E	2485-2664	75

Pottawatomie County

Magnolia	3	NW SW SE 19-7-5 E	4171-4173	3500
Independent	6	SEc 19-7-5 E	4105-4137	2135
Gypsy	2	NEc SE 25-7-4 E	4190-4219	1000
Phillips	1	SEc NE 24-7-4 E	4175-4199	95
Gypsy et al	5	NW SE NE 23-7-4 E	4145-4156	80
Gypsy et al	4	SWc NE 23-7-4 E	4145-4226	10
Shaffer	2	NW SE SE 23-7-4 E	4505-4525	820
Interocean	6	SE NW SE 23-7-4 E	4215-4233	900
Roxana	1	NWc SE NE 20-6-5 E	T.D. 4272	Dry

Seminole County

Company	Well No.	Location	Depth	Init. Prod.
Sinclair	4	NW NE SW 18-5-8 E	2725-2737	300
Sinclair	2	CEL NE SW 18-5-8 E	2604-2706	675
Burk-Greis	1	SWc NW NE SE 18-5-8 E	2522-2590	860
Anderson-Pritchard	6	NWc NE SE 18-5-8 E	2545-2607	800
Wigdon-Long	1	NWc NE 31-7-6 E	1169-1190	40
Roxana	4	NW NE NW 23-7-6 E	4210-4217	100
Roxana	3	SE NE NW 23-7-6 E	4267-4282	120
Pure	6	NW NE NE 23-7-6 E	4690-4694	280
Magnolia	2	SW NE NE 14-7-6 E	4110-4112	564
Magnolia	1	SE NE NE 14-7-6 E	4345-4353	696
Gypsy	10	NE SW SE 14-7-6 E	4268-4278	2185
Gypsy	9	SW SE SE 14-7-6 E	4358-4368	1100
Pine	4	SW NE SE 26-8-6 E	4220-4225	935
Texas	1	SWc NW 25-8-6 E	4143-4151	827
Superior	1	SW NW NW 1-9-5 E	4405-4419	10

Stephens County

Pace et al	3	SWc NW NW NW 18-2-7 W	1480-1511	10
Petroleum Prod	7	NEc NW NW SW 7-2-7 W	1528-1552	35
Amerada	3	SWc 12-1-4 W	3628-3642	103
Medlin et al	3	SWc NE SW SE 34-1-8 W	1642-1660	10
Douthitt et al	4	SEc NW NW 34-1-8 W	1670-1678	15
Clark et al	1	SEc SW SE 21-1-4 W	T.D. 3535	Dry
Martin et al	1	NEc SE 20-2-5 W	T.D. 2510	Dry

Tulsa County

Short	1	NEc SE 13-18-12 E	748-769	3
Tutin et al	1	CSL SE SE 5-19-10 E	340-348	2M

Wagoner County

Orr	3	SEc SW 34-17-18 E	396-432	4
Elk Drlg	4	CWL SW NW 22-18-17 E	777-782	5M
Hale-Ford	4	NEc SE SE NW 36-16-17 E	T.D. 932	Dry
Allen et al	1	NEc NW SW 30-18-15 E	T.D. 1350	Dry

KANSAS

Butler County

Blue Stem	4	CNL NW SE 5-27-6 E	2715-2759	350
Rosenthal et al	11	NW SE SE 4-27-6 E	3145-3159	200
Empire	2	SW NW SE 27-27-5 E	2724-2733	182
Empire	5	NE NW SE 22-27-5 E	2707-2758	192
Rogers	2	CEL NW SW 31-26-8 E	T.D. 1705	Dry
Pure	6	NEc SW 31-24-4 E	T.D. 2730	Dry

Cowley County

Trees	2	CWL SW NW 12-32-6 E	2493-2518	1.5M

Elk County

Denton et al	2	C NE NE 16-31-10 E	1130-1150	.2M
Tory et al	1	SE NW SW 10-31-10 E	1982-2020	75

Greenwood County

Amerada	3	NE NW SW 29-22-13 E	1667-1703	145
Ladow	1	SE SW NE 4-27-13 E	T.D. 1630	Dry

Marion County

Watchorn	1	SE SW NE 23-22-4 E	T.D. 2600	Dry
Derby	1	NE SW SE 14-17-4 E	T.D. 2496	Dry

Reno County

Empire-Marland	1	SEc NE 5-26-4 W	T.D. 4144	Dry

Russell County

Hartman et al	1	C SW 35-13-12 W	T.D. 3375	Dry
Keys	9	NE SE SE 32-13-15 W	3052-3092	150

Sumner County

Hartman et al	1	CWL NW 17-35-1 E	2270-2273	1.5M
Roxana	3	NEc SE SE NW 14-32-2 E	2040-2080	230
Washama	3	NEc SW 36-31-2 E	1931-1966	190
Roxana	10	CEL W½ SW 25-31-2 E	1860-1883	140
Nat. Union et al	1	Lot-4 Blk-18, 14-32-2 E	T.D. 2669	OWD Dry

New Field Operations in Oklahoma, Kansas, Panhandle, North, North Central and West Texas, Week Ended October 13, 1928

OKLAHOMA

Carter County

Company	Well No. Farm	Location
Hall et al	4-Miller	NEc NE SW 29-1-3 W
Boring et al	1-Fish	SWc NW NE SW 35-3-2 W
Texas	1-Eaves	NWc SW SW 24-1-3 W

Comanche County

Pewlin	1-Simpson	SEc SE 33-1-9 W
Franklin	1-Hollow	NWc 2-4-11 W

Cotton County

Stump	1-Jones	NWc NE 11-3-10 W

Creek County

Peters	4-Arsaylee	SWc NE NE 21-16-8 E	
Spears et al	8-Glenn	SWc NE NW 11-17-12	
Thompson-Black	2-Wilson	NWc SW 16-17-11	OWD
Avers et al	1-Fulsom	C SW SW 7-17-11	

Hughes County

Shaffer	1-Harner	SWc NE 20-7-8 E
Johnson et al	1-Turner	NWc SE 14-8-9 E
Atkins	1-Reed	NEc NW 2-8-8 E

Jefferson County

Dye et al	1-Barrett	SEc SE 5-6-7 W

Kay County

Carter et al	1-Lanbing	NEc NE 19-29-1 E

Company	Well No. Farm	Location
Superior	1-Shultz	NWc SE 10-27-1 E
Wilson	1-White	NWc SW 31-28-1 E

Lincoln County

Phillips	1-Roberson	SEc NW 29-12-3 E

Muskogee County

Blackwood et al	1-Burr	NEc NW SE NE 32-13-19 E
Sioux	2-Smith	SEc SW SE 18-15-19 E
Durham-Smith	1-Smith	SEc SW 18-13-19 E
Grubbs-Young	3-Friday	C SW NW 8-15-15 E
Babcock Bros	3-Bennett	C E W½ NE 8-15-15 E

Okfuskee County

Paden	1	SEc NE SW 8-12-7 E	
Kingwood	1-Holmes	SEc 16-11-11	OWD
Umburn	3-Simmer	SEc NE NE SE 11-10-10	

Okmulgee County

Lambert	1-Steiger	C NW SW 7-13-15 E	OWD
Penrod et al	11-Reynolds	NEc SW SE NW 15-13-14 E	
Misener	1-Thornsberry	NWc SE SW 13-13-14 E	
Brock et al	1-Holleyman	SEc NW 25-13-12	
Atlantic et al	1-Kemp	SEc NW 8-13-11	
Selby	10-Connor	C NW NW 6-14-15 E	
Texas	4-Hayes	NEc NW 25-15-14 E	
Papoose	20-Osborne	NWc SE SE 21-15-14 E	OWD

(*Continued on Page 63*)

New Field Operations in Oklahoma, Kansas, Panhandle, North, North Central and West Texas, Week Ended October 13, 1928

(*Continued from Page 62*)

Osage County

Company	Well No. Farm	Location	
Stanley et al	1	NWc SE 5-21-9	
Corbin-Haver	7	NWc SE SW 16-23-11	
McCune et al	10	SEc NE NW 15-24-8	
Stanley et al	1	SEc SW 10-25-8	
Carter	1	NEc SE 33-26-5	
Lewis et al	1	SWc NW 14-26-6	
Berlin	10	NEc SE SW 20-29-9	

Pawnee County

Thompson-Black	1-Lennex	NWc SW SW 14-20-9	

Pittsburgh County

McAylor et al	1-Reed	NWc SW NW 7-6-14 E	

Pontotoc County

Westheimer Daube	1-Patterson	NWc 29-5-8 W	OWD
Ramsey	2-Whitney	SEc NW 19-5-8 E	
Ramsey	1-Millner	SEc NW SW 17-5-8 E	OWD

Pottawatomie County

Magnolia	1-Nicholas	NWc 31-7-5 E	
Gypsy	1-Blandin	NEc 31-7-5 E	
Texas	3-Zoeller	NWc SE SE 30-7-5 E	
Texas	2-Zoeller	NEc SW SE 30-7-5 E	
Seminole	1-Church Ld.	NWc NE NW 29-7-5 E	
Roxana	2-Smith	NWc SW NW 21-7-5 E	
Magnolia	1-Guinn	SEc NE NE 20-7-5 E	
Shaffer	2-Phillips	NWc SW 19-7-4 E	OWD
Slick	1-Nix	SEc NW NW 12-8-3 E	
Atlantic-Phillips	1-Bank	SWc NE NE 11-9-4 E	

Stephens County

Pace et al	7-Bristowe	NWc NE NW 18-2-7 W	
Petroleum Prod	8-Bond	SEc NW NW SW 7-2-7 W	
Beever	1-Funk	SWc NW NE NW 30-1-8 W	
Brannon-Fisher	2-Maxey	SEc SW SE 19-1-8 W	

Seminole County

Slick	1-Wyetha	NWc SW SW 24-5-7 E	
Cal-Cul Oil Co	1-Cynda	SWc NW SW 24-5-7 E	OWD
Texas	1-Fleet	SEc 15-5-7 E	
Tidal	1-Harrison	SWc 2-7-7 E	
Gypsy	6-Cotcha	SEc NW SW 23-7-6 E	
Gypsy	5-Cotcha	SWc NW SW 23-7-6 E	
Slick	1-Davis	SEc SW 2-7-6 E	
Pine	2-Walker	NWc SW SE 32-8-7 E	
Pine	1-Walker	SWc SE 32-8-7 E	
Pine	8-Hoyecha	NEc SE 26-8-6 E	
Pine	7-Hoyecha	NWc SE SE 26-8-6 E	
Sinclair	1-Harjo	SWc SE 11-8-5 E	
Empire	1-Cluck	SWc NE 11-8-5 E	
Carter	6-James	SEc NE SW 6-9-6 E	
Gypsy	1-Andrews	NEc SW NW 27-10-7 E	

Tulsa County

Anthony	3-Whetstone	NWc NE SW 3-16-12	

Wagoner County

Ellis	1-Lewis	SWc SE 27-16-17 E	
Elk Drlg	1-Ridmore	SWc SE SW 36-17-17 E	
Shridan	1-Lewis	SEc NW 6-19-15	

KANSAS

Butler County

Phillips	6-Seward	NWc 13-27-7 E	
Garden et al	2-Sluss	CSL NE NW 6-27-6 E	
Empire	3-Brandenberger	SE SW NE 22-27-5 E	
Empire	3-Sherrock	NE SE SW 27-27-5 E	
Empire	1-Young	NW SE NW 27-26-7 E	OWD
Larobb et al	1-Jackson	NE NW SW 1-25-8 E	
Phillips	4-Haupt	NW NE NE 8-23-4 E	

Cowley County

Trees	1-Kinnemoth	C NW SW 12-32-6 E	
Empire-Marland-Twin State	1-Feaster	NWc NE 36-32-5 E	
Barnsdall	1-Kemp	SE SW SE 7-34-3 E	

Greenwood County

Brossius et al	1-Hendrickson	SE NE SW 8-25-9 E	
Haverhill	20-Inthurn	NWc SE 4-23-13 E	
Skelly	7-Schwab	CSL NW SE NE 30-22-13 E	
Pryor-Lockhart	2-Weinzler	SE SW NW 29-22-13 E	
Skelly	1-Pixlee	NE SE SW 3-22-10 E	

Marion County

Empire	1-Alder	NE SE NW 32-21-5 E	

Marshall County

Irwin Bros	1-Cooper	NEc NW 10-3-7 E	

McPherson County

Vickers	1-Wedel	C SW 12-20-2 W	
Merriman-Reeves et al.	2-Anderson	SE SW SW 29-18-2 W	OWD
McPherson	1-Roseberg	C NE NW 31-18-2 W	

Russell County

Mid-West Expl	16-Dortland	SE NW SE 5-14-15 W	

Sedgewick County

Van Zandt-Mason	1-Jones	C NW SW 19-25-1 W	

Sumner County

Roxana	14-Emerick	NWc SW SW SE 14-32-2 E	

TEXAS

NORTH AND EAST CENTRAL

Brown County

Company	Well No. Farm	Location	Survey
Cunningham-Texas	1-Brooks	Blk-115	Holstein
Burris et al	8-Newton	Blk-151	Curlong
Williamson et al	5-Eddington	Blk-141	Mitchell
Milham Corp. of of Tex.	5-Rosser	.....	Cross
Evans	1-Tervorren	Sec-11	HT&B
Lloyd	7-Collier	Blk-139	Smith
Wakefield et al	1-Wooldridge	Blk-155	Greenwood
Phillips	17-Hickman	Blk-783	Benson
Green et al	1-Hill	Sec-8	Walker
Hart et al	2-Hart et al.	Blk-35	H&TC

Callahan County

Warren	1-Seale	Sec-130	BBB&C
Andrews	2-Pippin	Sec-316	TE&L
Starr	1-Jones	Sec-40	D&DA
Mortimor et al	3-Hickman	Sec-1	I&GN
Childs	1-Foster	Sec-43	Comol Co. Sch. Ld.
Calloway et al	2-Kluttsk	Sec-44	Comol Co. Sch. Ld.

Coleman County

Isiny Prod	2-Eddington	Sec-28, Blk-187	Victoria Co. Sch. Ld.

Eastland County

Chestnut-Smith	2-Kurklin	Sec-62, Blk-4	H&TC

Jack County

Cunningham-Walton	1-Garrett	Abst-465	Putnam

Taylor County

Grisham-Hunter	1-Stephens	Sec-53, Blk-19	TP
Hurley	1-Payne	Sec-52, Blk-19	TP

NORTH TEXAS

Archer County

Gilliland	2-Roach	Sec-1595	TE&L
Rathke	6-Andrews	Abst-371	Spavin
Empire	1-Wilson	.....	Walker
Stumpf	1-Amer. Prop.	Sec-1, Abst-421	SP
Brown-Lickey	2-Wallace	League-3, Blk-11	DCSL
Texas	20-Richardson	Blk-7	SAR
Payne-Eddleman	4-Parrish	Abst-1004	SP
Minnick	1-Wilson	Abst-859	Scott
Thomas	1-Brown	Abst-384	Sellers

Cooke County

Sun	1-Dennis	Abst-437	Hermandz

Foard County

Fain-McGaha-Roxana	3-Mathews	.....	GC&SF

Grayson County

Knotts et al	2-Badgett	.....	Bradley

Montague County

Grant	1-Adams	Blk-10, Abst-580	O'Conner

Wichita County

Panhandle et al	2-Burnett	Sec-6, Abst-464	Meade
Comac Drlg. et al.	1-Kelly et al.	Sec-3, Abst-265	SP

Wilbarger County

Patterson	1-Burgess	Sec-54, Blk-4, Abst-1134	H&TC
Consolidated	2-Waggoner	.....	Calhoun
Texas	9-Waggoner	Sec-16, Blk-4	H&TC
Hampton-Wilson et al.	1-Waggoner	Abst-461	Purnell
Phillips	3-Waggoner	Sec-5, Blk-5	H&TC
Cosden	29-Waggoner	Sec-31, Blk-4	H&TC
Baker et al	6-Waggoner	Abst-461	Purnell

Young County

Albright	1-Jordan	Sec-1903	TE&L
Allday-Carter	1-Johnson	Blk-8	Sergeant
Magnolia	3-Johnson	Blk-13, Abst-253	Sergeant
Riggs	17-McKinley	Sec-1489	TE&L
Kennedy et al	3-Johnson	Blk-11, Abst-253	Sergeant
Kennedy et al	2-Johnson	Blk-11 Abst-253	Sergeant
Kleiner et al	26-Langston	Sec-1490	TE&L
Mook-Tex	9-Davis	Sec-1487	TE&L
Shappel	5-Garrett	Sec-1487	TE&L
Kleiner et al	5-Davis	Sec-1487	TE&L
Boller et al	9-Gregg	Abst-240	Rohus
Gwynn	3-Kunkel	Blk-4	BBB&C
Harrison et al	1-Allen	Sec-1497	TE&L
Four Oil Co	1-Pringle	Sec-216	TE&L
Allday	9-McKinley	Sec-1489	TE&L

PANHANDLE

Carson County

Duncan et al	1-Hodges	Sec-112, Blk-7	I&GN
Magnolia	6-Fee	Sec-91, Blk-4	I&GN

Gray County

Danciger	3-Morse	Sec-2 Blk-26	H&GN
Get Oil Co	1-Lefors	Blk-5	Lefors
Texas	4-Davis	Sec-86, Blk-3	I&GN
Texas	3-Davis	Sec-8, Blk-1	ACH&B
McMann	2-Binkley	Sec-86, Blk-3	I&GN

Hemphill County

Gagelly	1-Burnell	Sec-38, Blk-M-1	H&GN

Hutchinson County

Amarillo	1-Jameson	.....	Duboic
Devonian	9-Johnson	Sec-3	Whitley
Harvis et al	2-Bivins	Sec-91, Blk-46	H&TC

WEST TEXAS

Crane County

Tidal	1-Univ.	Sec-34, Blk-30	Univ.
Gulf Prod	56-McElroy	Sec-200, Blk-F	CCSD

Howard County

Green et al	1-Farrah	Sec-11, Blk-31	T&P
F. H. E.	5-Roberts	Sec-136, Blk-29	W&NW

Pecos County

Rio Pecos	1-Yates	Sec-543	H&GN
Zoch et al	1-Union Ld. Co.	Sec-35, Blk-12	H&GN
California	4-Smith	Sec-23, Blk-194	TC
Gulf Prod	22-Yates	.....	Runnels Co. Sch. Ld.
Gulf Prod	23-Yates	.....	Runnels Co. Sch. Ld.

Presidio County

Brite	1-Brite	Sec-50, Blk-12	GH&SA

Reeves County

Davis et al	1-McCart	Sec-26, Blk-C-18	T&R

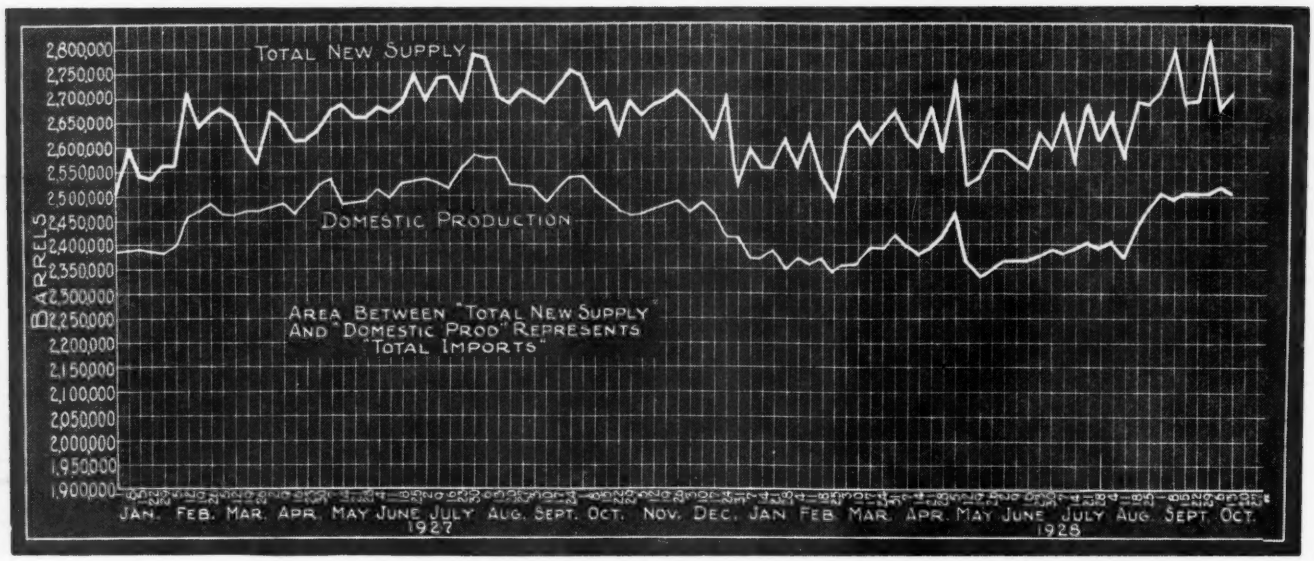
Runnels County

Union Oil Co	1-Allen	Sec-1	HE&WT
Foster et al	1-Curry	Blk-284	Carroll

Winkler County

Humble	17-Hendricks	Sec-41, Blk-B-5	PSL
Southern Crude	T88N5-Hendricks	Sec-28, Blk-26	PSL
Roxana	8-Hendricks	Sec-46, Blk-26	PSL
Southern Crude	T88B3-Hendricks	Sec-4, Blk-B-12	PSL
Southern Crude	T89E3-Hendricks	Sec-40, Blk-B-5	PSL
Southern Crude	T88M26-Hendricks	Sec-33, Blk-26	PSL
Southern Crude	T88U7-Hendricks	Sec-41, Blk-26	PSL
Southern Crude	T88O1-Hendricks	Sec-28, Blk-26	PSL
Southern Crude	T88T6-Hendricks	Sec-34, Blk-26	PSL
Southern Crude	T88D2-Hendricks	Sec-4, Blk-B-12	PSL
Gulf Prod	2-O'Brein	Sec-31, Blk-F	GMMB&A
Atlantic	2-Leck	Sec-3, Blk-74	PSL

Daily Average Crude Oil Production and Imports



Daily average gross output of United States, by fields, for week ending with dates below as compiled by American Petroleum Institute

PRODUCTION SUMMARY

	Oct. 13	Oct. 6
Production east of Rockies	**1,885,500**	**1,901,300**
Decrease		**15,800**
Total production in U. S.	**2,505,500**	**2,524,000**
Decrease		**18,500**
Crude Oil Imports	**207,857**	**144,286**
Increase		**63,571**
Total Crude Supply	**2,713,357**	**2,668,286**
Increase		**45,071**

OKLAHOMA

	Oct. 13	Oct. 6
North Braman	2,800	2,850
South Braman	1,400	1,400
Blackwell	3,500	3,500
Hubbard	2,650	2,750
Thomas	1,050	1,150
Tonkawa	12,000	12,050
Garber	7,600	7,700
Burbank	27,500	27,550
Osage, outside Burbank	27,000	26,950
Cushing	19,950	20,000
Yale Jennings	7,600	7,600
Davenport	1,750	1,800
Bristow-Slick	20,800	20,800
North Okmulgee	14,550	14,550
Pearson	2,300	2,600
Lyons-Deaner	5,650	5,650
St. Louis	122,400	117,050
Allen Dome	22,700	22,750
Cromwell	8,700	8,700
Papoose	3,950	3,950
Wewoka	5,450	5,450
Seminole	43,450	44,150
Bowlegs	52,050	52,050
Searight	11,800	11,550
Little River	135,650	134,900
Earlsboro	81,800	82,850
Duncan district	7,500	7,650
Graham	5,200	5,150
Fox	1,600	1,600
Healdton	13,800	13,700
Hewitt	9,500	9,450
Scholem Alechem	15,100	15,350
Others	49,750	49,800
Total, Oklahoma	748,500	745,000
Increase		3,500

KANSAS

Greenwood County	26,000	26,000
Florence-Covert	950	950
Peabody-Elbing	3,250	3,250
Eldorado-Towanda	12,750	12,750
Augusta-Fox-Bush	3,250	3,250
Rainbow Bend	1,350	1,400
Russell	4,450	4,100
Churchill	8,650	8,750
Oxford	9,200	9,100
Others	28,600	28,800
Total, Kansas	98,450	98,350
Increase		100

NORTH LOUISIANA

Homer	4,200	4,200
Haynesville	5,800	5,800
Caddo, light	9,250	9,250
Caddo, heavy	3,000	3,050
De Soto, Red River	3,950	3,900
Elm Grove	500	550
Bellevue	850	750
Cotton Valley	4,800	4,260
Urania	6,600	6,600
Pleasant Hill	600	550
Total, North Louisiana	39,550	38,900
Increase		650

ARKANSAS

El Dorado	5,250	5,250
Champagnolle	12,350	12,200
Smackover, light	7,350	7,300
Smackover, heavy	55,350	56,400
Stephens	1,050	1,000
Nevada	1,300	1,200
Lisbon	1,900	1,800
Others	100	100
Total, Arkansas	84,700	82,250
Increase		450

TEXAS (Outside Gulf Coast)

Panhandle District

	Oct. 13	Oct. 6
Hutchinson County	32,000	31,750
Carson County	6,400	6,500
Gray County	26,450	24,800
Wheeler County	950	950
Others	2,050	1,900
Total, Panhandle District	67,850	65,900
Increase		1,950

North Texas

Burkburnett	9,500	9,600
Electra	13,000	13,100
Iowa Park and K-M-A	3,500	3,550
Wilbarger	34,000	32,250
Archer County	19,350	19,500
Montague-Cooke	10,600	10,750
Others	600	600
Total, North Texas	90,550	89,350
Increase		1,200

West Central Texas

Stephens County	7,100	7,100
Eastland-Desdemona	6,650	6,600
Brown County	11,500	11,600
Coleman County	3,500	3,550
Callahan County	3,550	3,600
Shackleford County	10,700	10,850
Young County	8,350	8,200
Throckmorton County	800	800
Palo Pinto County	400	400
Jack County	1,500	1,500
Others	700	700
Total, West Central Texas	54,750	54,900
Decrease		150

West Texas

Jones County	4,250	4,000
Mitchell and Scurry Counties	2,900	2,900
Howard County	25,850	24,500
Reagan County	18,200	18,200
Crane and Upton Counties	55,800	55,800
Crockett County	3,150	3,050
Pecos County	74,450	78,500
Winkler County	147,600	165,500
Others	1,400	1,400
Total, West Texas	333,600	353,850
Decrease		20,250

East Central Texas

Mexia	6,600	6,600
Currie	550	550
Richland	500	500
Wortham	1,550	1,600
Corsicana-Powell	10,200	10,300
Nigger Creek	850	800
Others	2,300	1,900
Total, East Central Texas	22,550	22,250
Increase		300

Southwest Texas

Luling	13,300	13,450
Lytton Springs	1,100	1,100
Somerset	700	700
Laredo District	8,400	8,500
Dale	1,200	1,250
Others	500	500
Total, Southwest Texas	25,200	25,500
Decrease		300
Total, Texas—(Outside Gulf Coast)	594,500	611,750
Decrease		17,250

GULF COAST

Coastal Texas

West Columbia	7,400	7,400
Damon Mound	1,700	800
Big Creek	2,650	3,000
Boling	1,600	1,650
Blue Ridge	6,500	7,500
Pierce Junction	9,950	11,150
Humble	1,300	1,300
Goose Creek	6,800	6,700
South Liberty	3,350	3,700
Hull	12,350	12,100
Saratoga	1,000	1,000
Batson	1,350	1,400
Barber's Hill	1,500	600
Sour Lake	3,200	3,350
Spindletop	35,650	38,100
Orange County	3,600	3,700
Others	3,600	3,700
Total, Coastal Texas	103,500	107,150
Decrease		3,650

Coastal Louisiana

	Oct. 13	Oct. 6
Vinton	4,300	4,200
Sulphur Dome	3,400	3,500
Lockport	3,400	3,200
Sweet Lake	2,650	2,650
Evangeline	950	950
East Hackberry	2,600	2,500
Edgerly	900	800
Sorrento Dome	850	850
Others	1,500	2,550
Total, Coastal Louisiana	20,550	21,200
Decrease		650
Total Gulf Coast	124,050	128,350
Decrease		4,300

ROCKY MOUNTAIN

Wyoming

Salt Creek	38,650	39,650
Grass Creek	2,300	2,500
Elk Basin	1,100	1,050
Big Muddy	2,750	2,750
Lost Soldier	4,050	4,000
Rock Creek	2,600	2,700
Lance Creek	450	450
Oregon Basin	4,350	4,350
Others	3,950	3,900
Total, Wyoming	60,200	61,350
Decrease		1,150

Montana

Cat Creek	1,600	1,600
Sunburst	8,300	8,300
Pondera	300	.....
Others	500	800
Total, Montana	10,700	10,700

Colorado

Moffat (Craig)	1,200	1,300
Fort Collins	2,650	2,650
Florence	1,100	1,300
Others	2,500	2,050
Total, Colorado	7,450	7,300
Increase		150

New Mexico

Table Mesa	.....	200
Hogback	500	500
Artesia	1,050	1,050
Rattlesnake	1,650	400
Others	200	200
Total New Mexico	3,400	2,350
Increase		1,050
Total, Rocky Mountain	81,750	81,700
Increase		50

California

Santa Fe Springs	37,000	36,000
Long Beach	189,000	192,000
Huntington Beach	52,000	52,000
Torrance	16,000	16,500
Dominguez	10,500	10,700
Rosecrans	5,500	5,500
Inglewood	28,500	28,500
Midway-Sunset	74,000	74,000
Ventura Avenue	54,000	54,000
Seal Beach	25,500	25,500
Others	128,000	128,000
Total California	620,000	622,700
Decrease		2,700

Refinery Engineering Section

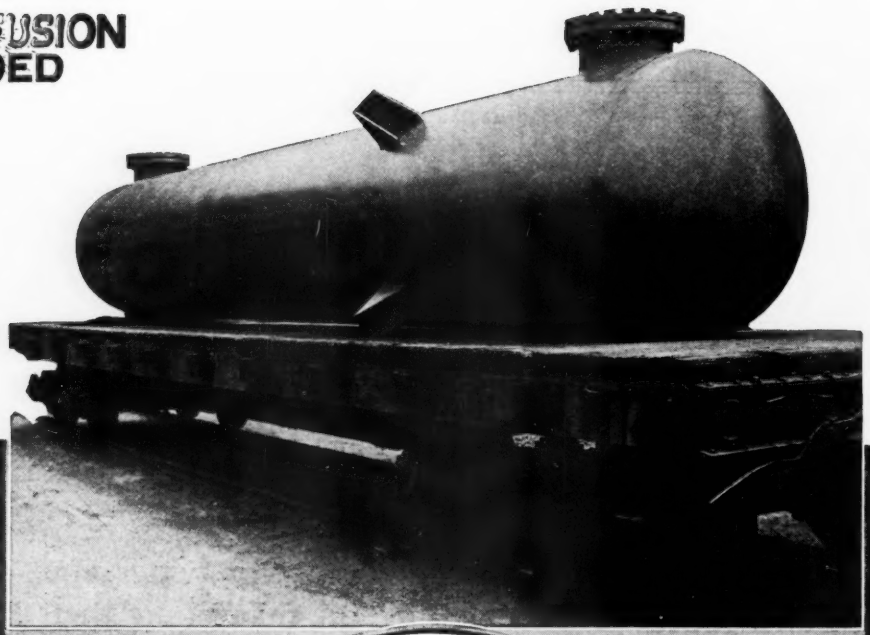
PROGRESS in the refining art is rapid. It has to be because of the insistent demand of refiners, forced by economic conditions, for better and cheaper ways of making and marketing their products. Every refinery operating man is interested in the various improvements that are being made constantly.

¶ Because of the difficulty of reading or even glimpsing the great mass of literature in which the advances in the art are recorded, it seems a good thing once in a while to get men who know what they are talking about, specialists in their respective fields, to write papers on their subjects and thus bring together a collection of facts, opinions and ideas on various phases of the refining business, between two covers where they can be conveniently studied and afterward laid aside for future reference.

¶ That is what NATIONAL PETROLEUM NEWS has done in this issue.

¶ We thank the contributors heartily and we hope their efforts prove of great beneft to the men who are wrestling with the problems involved in making refinery properties show a profit.

FLUID-FUSION WELDED



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Stills—6" thick walls;
Oil Refining Equipment;
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Vacuum Vessels;
Agitators;
Chemical Processing Equipment;
Oil Storage Tanks up to 120,000 barrels capacity;
Elevated Water Tanks;
Pressure Pipe Lines;
Penstocks;
Auto claves;
Kilns;

P.I.W. Pressure Vessels

withstand the combined high pressure and high temperature of modern cracking because the Fluid-Fusion fabricating method produces a weld stronger than the plate itself and so absolutely pure and perfectly fused that the vessel reacts as one piece of metal to the stress of high pressure operation.

The wall thickness of Fluid-Fusion welded stills exceed 6 inches and the dimensions are set only by transportation limits.

Your nearest P.I.W. office will gladly send an engineer to consult on your high pressure problems.

BRANCH PLANT
Beaumont, Texas

P.I.W. PRODUCTS

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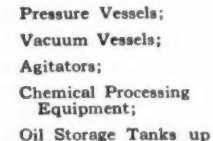

P.I.W. STEEL PLATE CONSTRUCTION

The PETROLEUM IRON WORKS COMPANY
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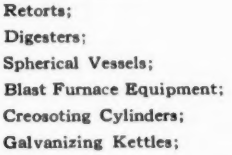

Recent Developments in Heat Generation and Application In Petroleum Refineries

By L. A. Mekler*

L. A. MEKLER

REFINERIES, as a rule, are compelled to generate their heat from much lower grades of fuel than are used in other industries. This is particularly true with respect to the liquid fuels used. A wide application in recent years of cracking processes has resulted in production of large quantities of heavy liquid residues which cannot be sold to the average fuel oil user.

Most refineries produce such residues in amounts greater than can be blended with other fuels so that the blend meets standard specifications. Some residues, particularly the residues from cracking processes that give high gasoline yields from heavy charging stocks, cannot be blended at all and have to be consumed "as is" by the refinery.

A large number of the residues are practically solid at atmospheric temperatures, their viscosity is very high and, in some of them, the B. S. content reaches 60 per cent. The majority of such residues must be heated to as high as 350 degrees F. to make them fluid enough to be transported through the fuel oil mains of the refinery. Quite often, when heated much beyond the minimum temperature required to make them fluid, the residues begin to deposit the solid matter they contain, unless they are kept in constant and more or less violent agitation.

Heavy residues can only be handled by means of a circulating system which keeps them in constant turbulent motion and so prevents any heavy precipitation of solids they contain. In extreme cases when the amount of solids is high and the solids have a tendency to precipitate when the residue is heated, mechanical agitation of the supply tank by means of paddles or propellers is used to supplement the agitation in the tank produced by the circulation.

Fig. 1 shows a schematic layout for a series flow fuel oil circulating system. With this system, fuel is pumped through a loop around the different units which draw upon the fuel supply. A larger amount than is consumed by the units, (usually three times as much) is pumped through the loop and the excess is returned to the fuel supply tank.

The series flow circulating system is most commonly used at present, because it is the simplest to install and to operate. It gives a full volume flow throughout the system so that no part of the system can plug up as long as any fuel is returned back to the supply tank.

On the other hand, because of the full volume flow, the pressure drop between the supply and the return ends of the circulating loop is quite high, particularly if a large amount of fuel is circulated and the circulating loop is long. In some cases this pressure drop reaches 100 pounds per square inch so that with 30-40 pounds per square inch pressure on the burners at the end of the loop the pressure at the beginning of the loop is often 130-140 pounds. With low rates of firing, a high fuel oil line pressure requires small openings in the valves and burners, particularly with a low rate of firing through individual burners, which makes them liable to plug up with a bad fuel. A series flow circulating system is, therefore, best applicable to short lines which do not have a high pressure drop and can be operated with a low pressure on the burners.

Fig. 2 shows a parallel flow circulating system for the same plant layout. In this system each unit draws the fuel from a common supply header and returns the unused fuel (about twice the amount used) to a common return header. A properly designed parallel flow system is preferable to the series flow system, because even with long fuel oil lines it can be operated at a low pressure throughout the line. The only disadvantage of this system is in the possibility of some branches plugging up when not sufficient oil is circulated through them.

Heavy residues, with a high B. S. content, require somewhat different types of burners and burner settings than those commonly used on fuels of "Bunker C" specifications or better. The conventional steam atomizing burners, whether of the internal or external atomizing type, usually are not satisfactory. To properly atomize heavy residues, high pressure atomizing burners must have high velocities and, therefore, small orifices, which makes these burners liable to plug up. When the orifices are made large enough to offset the tendency of the burners to plug up, atomizing becomes very poor and long dirty flames are produced in the furnace. Such flames are objectionable, particularly in stills, not only because they impinge on the brickwork and

*Combustion Engineer, Universal Oil Products Co., Chicago.

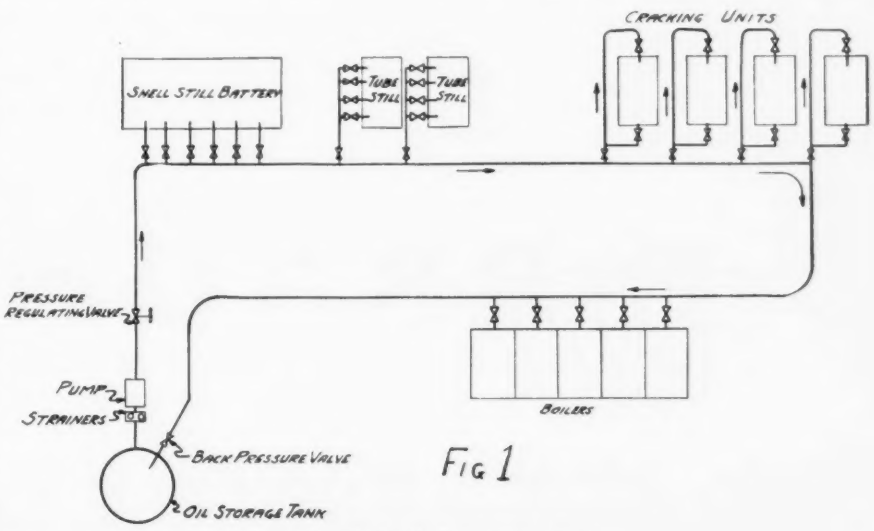

Fig. 1. Series flow circulating line

A *New* COOLING TOWER

by

BRAUN

1. Drifting water spray and poor distribution of water have long given trouble to operators of atmospheric cooling towers. Heretofore numerous devices have been placed on the market to eliminate these difficulties but always at the sacrifice of efficiency.

2. The new Braun cooling tower uses new type BRAUN VENTILATOR-SEPARATOR LOUVRES (patent applied for) which

   A. Eliminate objectionable water spray by separating the mechanically entrained water from the effluent air.
   B. Create uniform distribution of air through the tower at uniform velocities.
   C. Produce even distribution of water regardless of wind.
   D. Accomplish positive separator action in all winds without adjustment.
   E. Maintain cooling efficiency.

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the heat absorbing surfaces which tends to burn them out, but also because the long flames are highly luminous and give off too much radiant heat energy to the heat absorbing surfaces, overheating these surfaces and the oil in contact with them.

The operation of high pressure atomizing burners can be considerably improved if the burners are installed to fire through elongated refractory tunnels of comparatively small cross-sections. Such tunnels provide a zone of secondary intimate mixing of the atomized oil and air and incandescent surfaces around the tip of the burners shortly after the burners are lit.

The incandescent surfaces assist the ignition of the fuel-air mixture and act as a catalytic agent for the reaction of combustion. The mechanics of combustion is improved all around and even with poorly atomized heavy fuel the flames, if desired, can be confined to the tunnels.

The advantages of using combustion tunnels when burning high B. S. residues with high pressure steam atomizing burners is best demonstrated by results obtained with a 60 per cent B. S. flux as fuel on a reducing still equipped with radiant heat roof tubes before and after the installation of the tunnels.

With the conventional burner setting the long flames impinged upon the roof tubes and coked up these tubes whenever throughput was raised above 2,000 gallons per hour of fuel oil with 70 per cent gas oil taken overhead. Even with this throughput the still had to be shut down because of coke formation in the roof tubes every 3 days. When the setting was changed so that the burners fired through fire brick tunnels 12 by 12 inches 6 feet long giving short clean flames, and no impingement, a throughput of more than 3200 gallons per hour was maintained with the same per cent overhead and the still was kept on stream 8 days. The total amount of coke deposited in the tubes when the still was fired with the tunnels was less than one-half of that produced during the shorter run with the smaller throughput when the still was fired in the usual manner.

Even with the improved combustion obtained with the tunnels, high pressure steam atomizing burners do not give as good results as can be obtained with low pressure air atomizing burners.

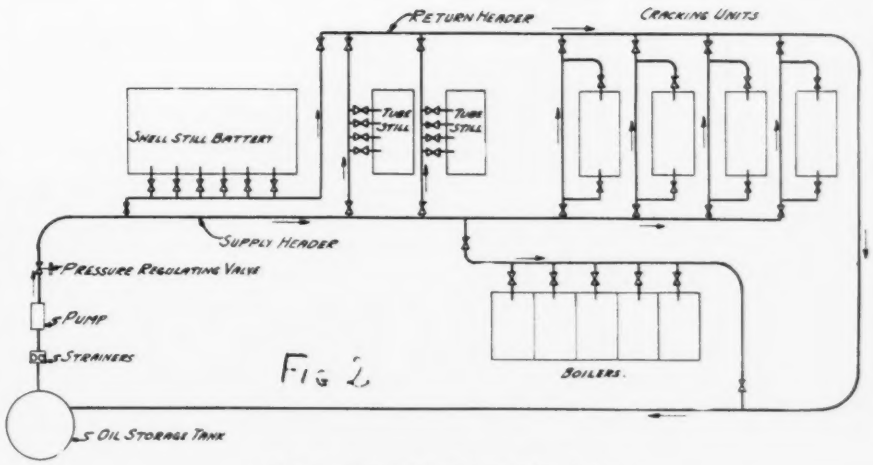


Fig. 2. Parallel flow circulating line

Fig. 3 shows a section through a low pressure air atomizing burner extensively used in the metallurgical and ceramic industries with "Bunker C" oil, and recently successfully applied to burn heavy Dubbs residuum and asphalt cut backs.

The fuel is atomized by triple impact with the atomizing air, the direction of flow of air being always at an angle to the general direction of the oil flow. The first impact occurs at A, where approximately one-fourth of the total atomizing air is brought in contact with the oil.

At B another portion of the air strikes the oil to be atomized. Final atomization is produced in the air orifice of the burner. By this time the oil is thoroughly mixed with the atomizing air and is ready to ignite as soon as sufficient secondary air is admitted around the burner.

The sliding air valve V in the air orifice allows to maintain the full air pressure on the burner irrespective of the total volume of atomizing air, therefore the same degree of atomization is obtained with different amounts of oil burned per burner. Five to 10 pounds per square inch oil pressure is sufficient to operate the burner, permitting the use of large oil orifices in burners and valves. The smallest oil orifice is ⅛-inch and only extremely large coke particles will plug up this burner.

When this occurs the needle valve like plunger P is used to crush the obstructing coke particles. The burner uses 8 to 16-ounce air delivered by a centrifugal blower.

Approximately 40 per cent of the theoretical air required for combustion is passed through the burner. The remainder of the air is either induced by the spray of the fuel-air mixture, or can be supplied by an auxiliary forced draft fan. In this case, the secondary air may be preheated, which will result not only in better combustion, but in fuel economies as well. The burner is made in capacities from 5 to 50 gallons per hour and can be used in open flame furnaces equipped with combustion tunnels, and shielded flame carborundum muffles.

Fig. 4 shows a cut away photograph of a low pressure air atomizing burner where the oil is atomized by centrifugal force by being fed into a rapidly rotating cup A placed at the end of the oil path in the burner. The rotary motion of the cup is produced by a propeller N attached to the cup and actuated by the air supplied to the burner.

The air is delivered at a pressure of 8 to 24 ounces, depending on the character of the oil, the type of the flame required and the amount of fuel burned per hour. The shape of the flame is governed by the inside diameter of the bushing P inserted into the tip of the burner. A large size bushing produces a short ball like flame. As the size of the bushing

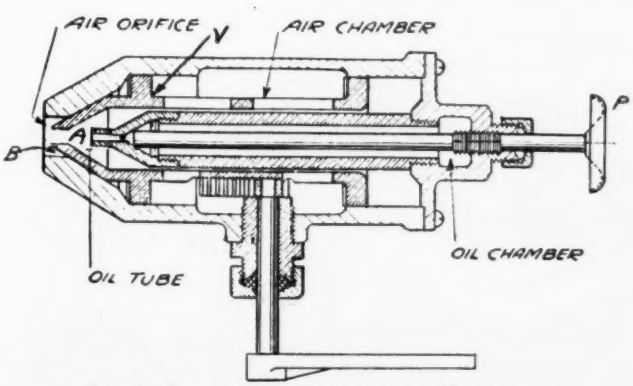


Fig. 3. Low pressure air impact atomizing burner
Courtesy Tate-Jones Co.

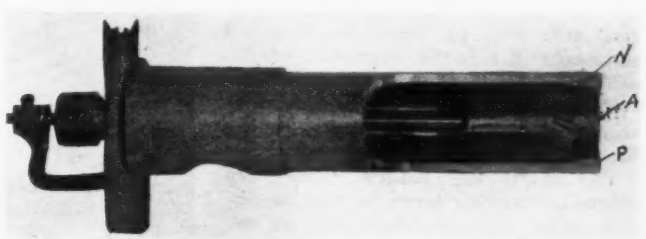


Fig. 4. Low pressure air centrifugal burner
Courtesy Radiol Burners Inc.

is decreased the flame becomes narrower and longer.

In this burner atomization of the oil is accomplished by the centrifugal action of the rotary cup only and not by high velocity impacts of the atomizing medium on the oil, therefore the burner can be operated with oil pressures just sufficient to deliver the oil to the burners. Oil orifices even larger than those in the impact type low pressure air atomizing burner can be used in this burner and, therefore, much heavier oil burned without the burner plugging up. At one refinery such burners installed under boilers not only consumed Dubbs residuum from a semi-residuum operation (containing 45 per cent B. S.) without preliminary settling of the greater part of B. S. as was the practice in the past, but have burned up the tank settlings accumulated previously.

In addition, because of shorter flames produced by the burners, and the ease of maintaining a constant rate of firing, the boiler ratings were considerably increased, with the result that five boilers are now doing more work than seven boilers did when they were fired with conventional high pressure steam atomizing burners. Fig. 5 shows a photograph of the installation.

When a large amount of fuel can be burned in one furnace, such as those of large boilers or tubular topping stills, heavy residues, acid sludge, tank settlings, etc. can be burned in a rotary type of burner shown in Fig. 6. The burner operates with forced draft and the primary air is supplied to the feed end of the burner from a low pressure blower connected to the same prime mover that rotates the burner. The speed of the burner (1 to 4 revolutions per minute) is adjusted according to the type of fuel burned and the capacity required.

As the fuel travels toward the discharge end of the burner, constantly exposing new surfaces to the action of the air, it is either completely burned within the burner (when the burner is operated at low capacity) or is gasified in the burner and burned in the furnace proper. Any carbonaceous material that can be delivered to the burner is easily consumed by it. At one refinery the burner is used as an all around incinerator for acid sludge, tank settlings, spills, refinery slop, etc. In spite of the heterogeneous materials fed to the burner it maintains a 500 horsepower Sterling boiler at a 200 per cent rating with an overall thermal efficiency of approximately 75 per cent. When the character of the material burned changes too radically within short periods, an auxiliary oil or gas burner is used to take up the fluctuations.

To adopt the rotary burner to plants not having large boilers or topping stills, the manufacturers of the burner are at present working on a method of using the burner as a raw gas producer from which a number of small units can be fired in the same burner as a number of industrial furnaces are now fired by raw producer gas from conventional producers.

Refiners having a large cracking capacity, particularly when they are cracking heavy charging stock to produce high yields of gasoline with very little or no liquid residuum, produce large quantities of petroleum coke. Approximately 1,000,000 tons of this coke is produced by the refineries per year.

Most refineries are located away from large centers of population (where considerable quantities of coke are consumed as a domestic fuel), or from large industries (where the petroleum coke could be used instead of coal in powdered fuel installations) and, therefore, have either to consume the coke themselves or accumulate a constantly growing coke pile.

A constantly increasing number of refineries is now consuming the coke, either on grates by mixing it with about 50 per cent of coal or alone in powdered form.

Petroleum coke is an ashless, smokeless, clean, rich fuel. An average cracking still coke contains less than 1 per cent of ash and not more than 1½ per cent of water. The volatile matter is approximately 12 per cent, fixed carbon 85 per cent, and sulfur less than 1½ per cent. The calorific

Table I(***)

Results of Firing a 550 H. P. Edgemoor Boiler with Petroleum Coke

Screen Analysis (*)		Per cent
Through 200 mesh		81.9
Through 150 mesh		93.7
Through 100 mesh		99.2
Over 40 mesh		.2
Chemical analysis of coke	**As Fired**	**Dry**
Volatile matter	15.40	16.5
Fixed carbon	77.47	83.00
Ash	.47	.50
Moisture (**)	6.56	.....
Heating value and B.T.U. per pound	14,712	15,869

Performance	
Actual water evaporated per hour	41,070 lbs.
Equivalent evaporation per hour	44,648 lbs.
Equivalent evaporation per pound of fuel as fired	12.19
Equivalent evaporation per pound dry	13.07
Flue gas temperature	550° F.
CO_2 in flue gases—per cent	15.03
O_2 in flue gases—per cent	4.68
CO in flue gases—per cent	None
Boiler efficiency without economizer—per cent	80.5
Comparative efficiency including economizer—per cent	86.07
Average K. W. H. to pulverize one ton of coke	21.1

* The coke was powdered much finer than necessary.

** Excessive moisture was due to mechanical admixture of water so as to determine the operation of the pulverizer under extreme moisture conditions.

*** L. A. Mekler, "Petroleum Coke, Its Present Uses and Possible Application," Fuels and Furnaces, December, 1927.

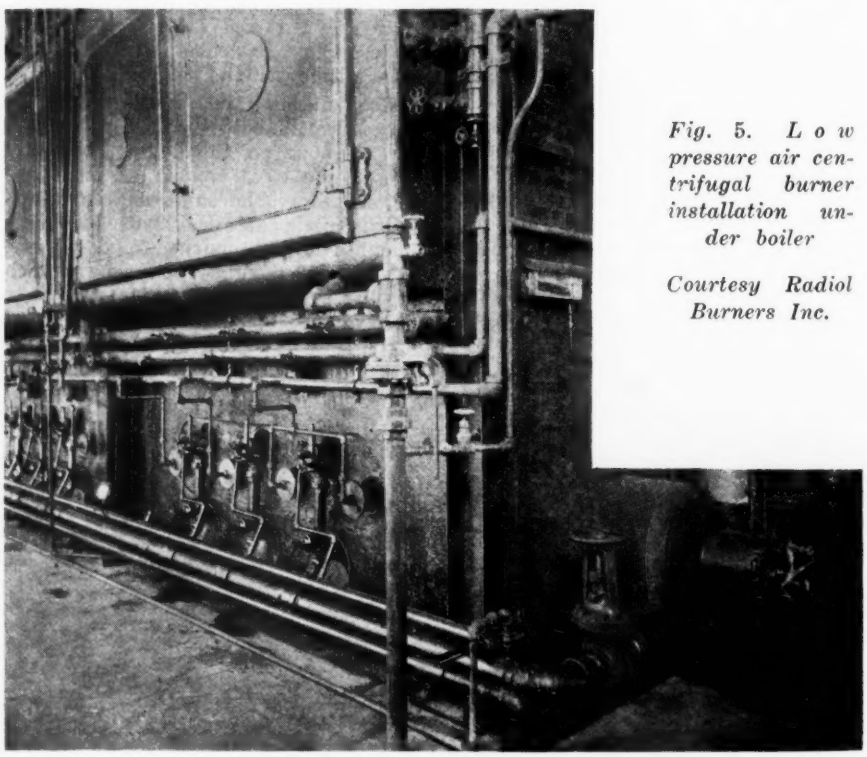


Fig. 5. Low pressure air centrifugal burner installation under boiler

Courtesy Radiol Burners Inc.

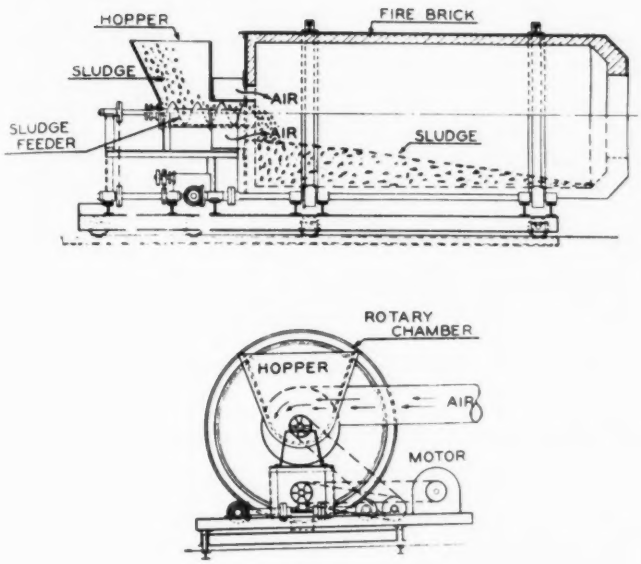


Fig. 6. Rotary sludge burner
Courtesy Illinois Stoker Co.

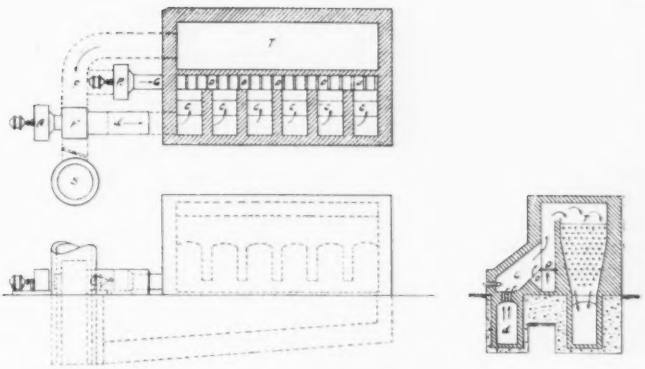


Fig. 7. Convection recirculating still

value is over 15,000 B.t.u. per pound.

Petroleum coke and particularly the screenings make an ideal fuel for pulverization. With a properly designed pulverizer the coke can be pulverized without weathering or drying, and with an average oil and moisture content usually found in the coke it requires less power to pulverize than most coals used in powdered fuel installation. The low ash content of the coke eliminates the problem of fluxing of refractories and stopping up of flues and passages with fine ashes as is common with powdered coal.

Table I shows the results obtained with powdered coke on a 550 horsepower Edgemoor 3-pass boiler at one of the public utilities in the Mid-Continent. Very satisfactory results are also being obtained with powdered coke on tubular topping stills of the open radiant heat type and on some experimental installations under large capacity shell stills. Manufacturers of pulverizing and powdered fuel burning equipment are at present working on the development of methods to burn powdered coke in small burners so as to use the coke to fire small units or large units having a large number of small burners. Experiments made up to date look very promising and the whole problem seems to be that of evenly dividing the powdered coke from the pulverizer into a number of equal small streams.

Heat application is one of the most important, if not the most important—single manufacturing operation of petroleum refining and quite often determines the quantity of the materials obtained and their quality. Petroleum products are very susceptible to thermal treatment, particularly at the higher temperatures, and overheating results in overproduction of tars, coke, and gas, and higher treating losses. Modern stills are, therefore, designed to give uniformly mild heating to bring the oil to desired temperature and, if necessary, to keep the oil at this temperature through a desired "soaking period."

With the exception of the Stratford internal oil circulating shell still, all modern stills are of the tubular design. The convection tubular still is as yet the most commonly used. In this still the heat absorbing surfaces are protected by a bridge wall or checkerwork from radiant heat of the flame and the combustion chamber refractories. The greater part of the heat input into the heat absorbing surfaces is obtained by convection and radiation from comparatively low temperature gases passing over these surfaces.

Recent researches on the subject have proven that even in the so-called convection still with non-luminous gases passing over the tubes more than one-half of the total heat obtained is by radiation from the gases, particularly if the fuel is burned with a small amount of excess air.

The convection still is most efficient when equipped with a properly designed flue gas recirculating system. The recirculating system allows the furnace to be operated economically with large gas volumes and high gas velocities, and a small amount of excess air. High gas velocities increase the convection heat transfer coefficient, while small amounts of excess air give high CO_2 and H_2O contents in the products of combustion

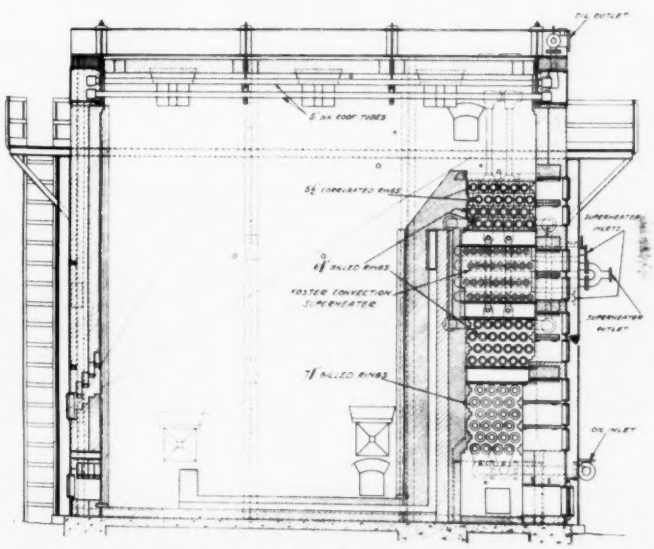


Fig. 8. Open flame radiant heat still
Courtesy Foster-Wheeler Corp.

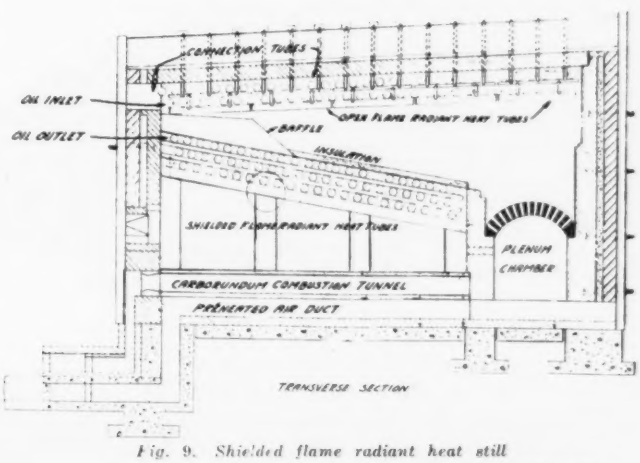


Fig. 9. Shielded flame radiant heat still
Courtesy Alcorn Combustion Co.

which increases their radiant heat emanation.

Besides, by returning the flue gases to the furnace often at 1100 degrees F., the recirculating system recovers a large portion of the heat that otherwise would have been lost through the stack. A well designed flue gas recirculating still has an efficiency of 60 to 65 per cent and has approximately 30 per cent higher heating capacity than the same size convection still without flue gas recirculation.

The present tendency in the design of recirculating stills is to use high capacity, low speed, recirculating fans built of high temperature corrosion resistant metals. Such fans are practically free from mechanical troubles and have a low maintenance and operating cost.

Fig. 7 shows a modern recirculating still. The still is side fired into a number of fire boxes which gives good control of distribution of fresh products of combustion, considerably better than can be usually obtained with end fired furnaces. The returned gases are withdrawn at one point between the still and the stack, so that the draft distribution in the still is not affected by stopping the recirculating fan. The gases are distributed at an angle to the path of the fresh products of combustion through a tile covered flue which induces a thorough mixing of the fresh and recirculated gases.

Fig. 8 shows a typical open flame radiant heat still. The roof tubes over the combustion chamber absorb the radiant heat from the flame and the brickwork in the chamber. A convection section, usually with gill ring tubes, is placed behind a bridge wall to absorb the heat from the gases as they pass over these tubes on their way to the stack. An air preheater is inserted between the still and the stack to preheat the air for combustion and to reduce the flue losses.

The roof tubes absorbing radiant heat in the combustion chamber not only supply the oil with the greater portion of the necessary heat, but reduce the heat content of the products of combustion and, therefore, their temperature before they come in contact with the convection section of the still and so eliminate the necessity of excess air or flue gas recirculation, used as furnace temperature modifying mediums in the convection still. The still is quite flexible as to capacity and operates best with a small amount of excess air.

The thermal efficiency of the still is usually over 70 per cent. The large size combustion chamber of the still makes it adaptable to any type of fuel and a number of such stills are equipped for burning either gaseous, liquid or powdered solid fuel.

Fig. 9 shows the general construction of a shielded flame radiant heat still. The still is fired through a number of narrow carborundum tunnels which become incandescent and act as a source of radiant heat energy absorbed by the bank of tubes placed above the carborundum. The products of combustion, considerably cooled by radiation to these tubes, pass from the carborundum tunnels into a plenum chamber covered with a perforated arch.

The arch and the products of combustion leaving the arch give off radiant heat energy to the tubes above the arch. The convection section of the still forms the last pass of the gases in the still and cools these gases to within 200 to 300 degrees F. of the temperature of the oil entering the still.

With a small heat input into the oil the greater portion of the heat input is absorbed by the tube bank above the carborundum chambers. As the heat load of the still is increased, a larger portion of the total heat is carried away by the products of combustion into the plenum chamber and delivered to the tubes above the perforated arch of the chamber and the convection section of the still until the non-shielded radiant heat tubes and the convection section carry the greater part of the load. The non-shielded radiant heat tubes, therefore, act as a means of taking up the overload by having a higher rate of heat absorption with higher rates of total heat input.

Because of the method of firing and the large number of burners required, the shielded flame still, at least for the present, is limited to firing only with gas or a clean liquid fuel. The results obtained with firing high B. S. content fuels through tunnels and the experiments with burning powdered coke in the tunnels justify the belief that within the near future the fuel limitations of the shielded flame radiant heat still will be completely overcome.

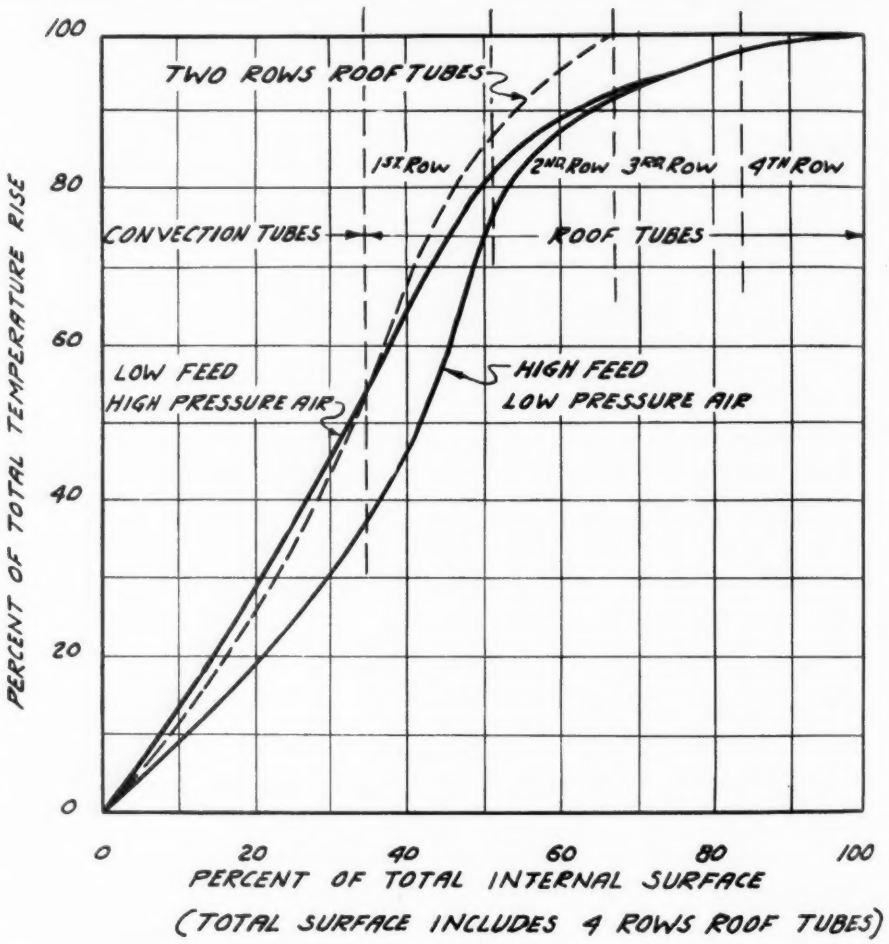


Fig. 10. Oil temperature raise in open radiant heat still with two and four rows of radiant heat tubes

Both types of radiant heat stills are easily adapted to a soaking section. A single row of radiant tubes absorbs approximately 80 per cent of the total radiant heat available. If two rows of radiant heat tubes are used they will absorb approximately 90 per cent of the total available radiant heat, but the tubes directly exposed to the source of radiant heat absorb approximately two and one-half times as much heat as the row behind.

Three rows of radiant heat tubes will take up only 2 to 3 per cent more than two rows, but the rate of heat input into the third row is about one-quarter of that into the

second row input and less than one-tenth of the heat input into the first row.

The fourth, fifth and further rows have a negligible rate of heat input and do not increase appreciably the total heat input into the bank.

Any row above the second will, therefore, act as a soaking section where the oil is kept without any noticeable increase of the sensible heat.

Fig. 10 shows the rate of heating of oil obtained with an open flame radiant still with two and four rows of roof tubes. In both cases the still was under pressures of 600 to 700 pounds per square inch, with a negligible evaporation in the tubes, so that practically all of the heat input into the oil is sensible heat and the ratio of temperature raise of the oil in the different rows can be taken as approximately the ratio of heat input into these rows.

Substantially the same type of heating curves can be obtained with the shielded flame radiant heat still if more than two rows of tubes are placed above the carborundum tunnels, or above the perforated arch of the plenum chamber. The still shown in Fig. 9 is designed to give a soaking effect to the oil in the third row of tubes in the shielded flame radiant heat section, which is the last path of the oil in the still.

The present tendency of the refining industry is to carry out operations in large capacity units with the least possible time offstream. Ten thousand-barrel topping stills are quite common and a number of Dubbs cracking units are being operated with a throughput of 3000 barrels per day, which at a 25 : 1 reflux ratio, is slightly over 10,000 barrels of oil heated per day. The larger the unit the greater the effort to put it back on the line, with the result that the average stream to stream period for stills and clean-out period for boilers is now reduced to less than one-half of what was considered good practice a few years ago.

High capacity operation and short off stream periods subject the brickwork of the units to much higher temperatures and more severe expansion and contraction strains than were encountered in the past, and conventional refinery brickwork does not satisfactorily meet the harder service of present day operation, particularly on units which have a comparatively short operating cycle.

Depending on furnace temperatures and the operating schedule, modern refinery settings are made either with suspended fire clay shape walls, or with walls laid in the conventional manner with insulating refractories instead of fire brick. In either case flat suspended roofs are used instead of radio arches.

Fig. 11 shows a suspended wall construction where the fire clay shapes are suspended in groups on castings attached to a structural steel skeleton. The castings and the supporting steel are cooled by air circulating between the refractory shapes and an outer wall made either of red brick or a semi-insulating wall board. In most installations the cooling air is used as a part of the air for combustion, either directly or after it is passed through a preheater.

Fig. 12 shows a suspended wall construction where the special refractory shapes are supported, not in groups but individually, with a 4½ by 2½ by 9-inch fire brick as a spacer. In all other respects this wall is similar to that shown on Fig. 11.

Suspended walls are applicable best to furnaces, the refractories of which are subjected to high temperatures, such as found in open flame radiant heat topping and cracking stills, high capacity boilers, etc., particularly if the setting is large and the overall expansion and contraction is high. With suspended walls it is possible to take care of both the horizontal and vertical expansion, because each suspended unit is free to move and is not subject to the load of the wall above it.

Suspended walls are more expensive than the conventional composite fire brick-insulation-red brick construction, but because of their longer life and negligible maintenance cost, suspended wall settings cost less in the long run, as has been proven in a number of high capacity boiler installations.

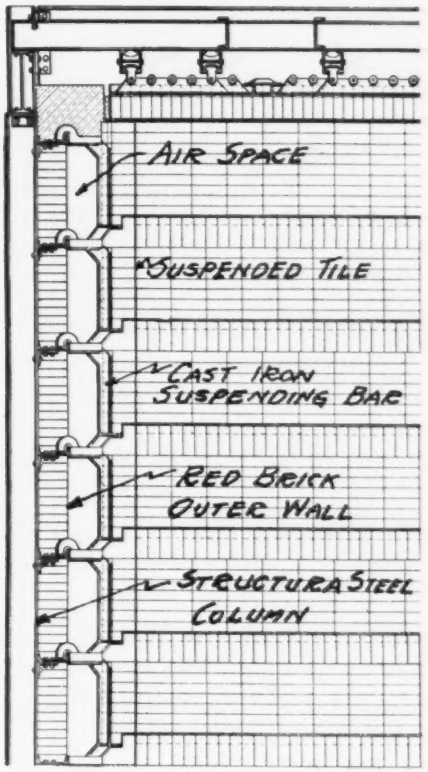
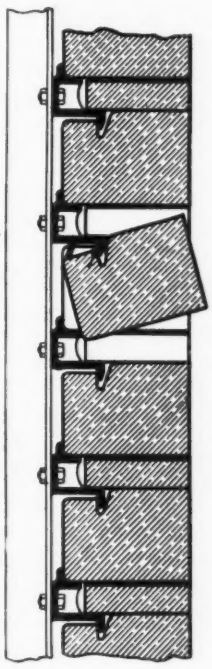


Fig. 11. Suspended air cooled refractory wall construction
Courtesy Detrick Co.

With comparatively low furnace



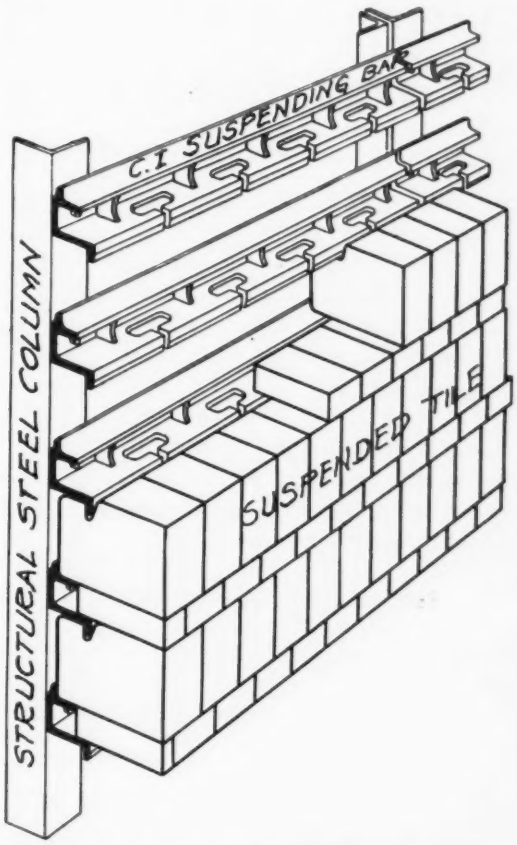
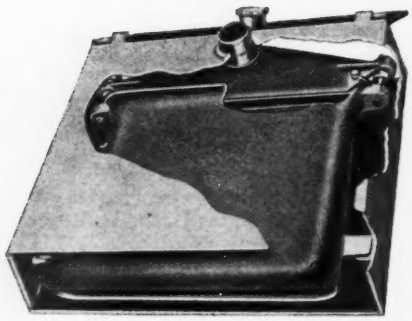


Fig. 12. Suspended air cooled refractory wall construction
Courtesy Bigelow Liptack Corp.



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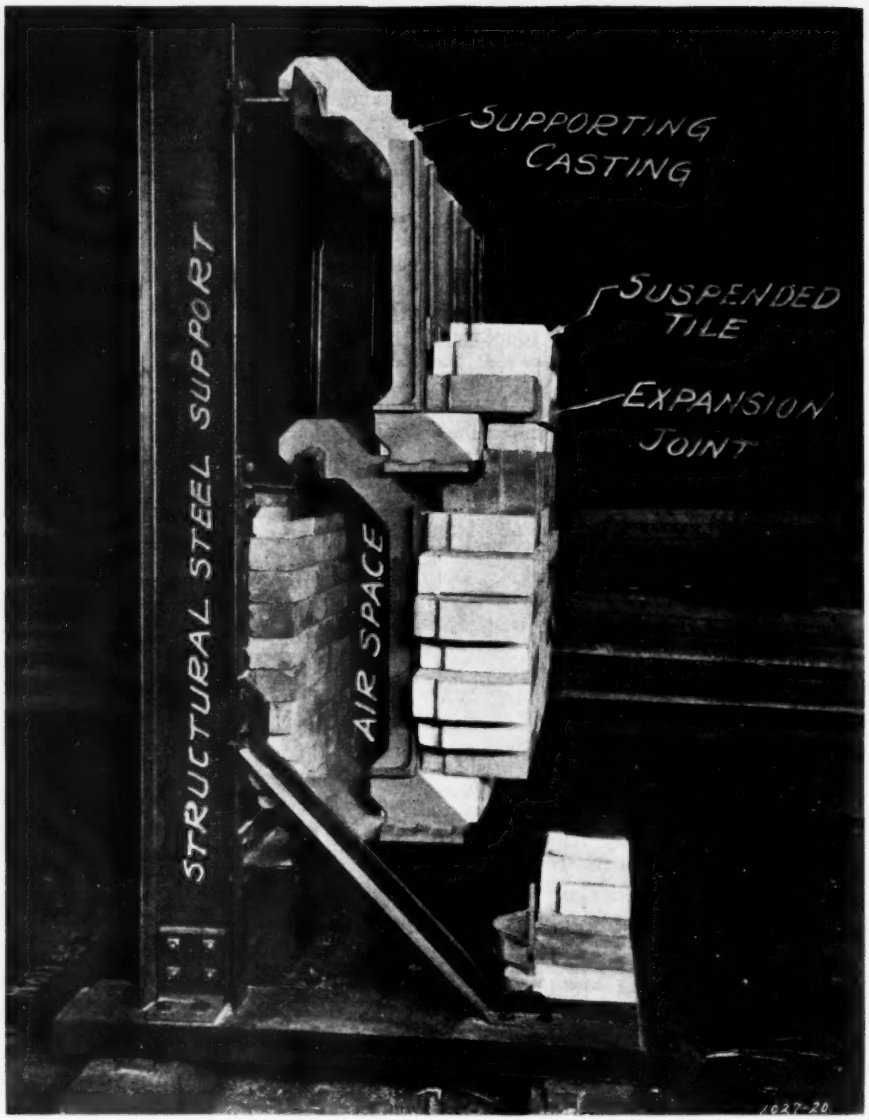

Courtesy American Arch Co.

Fig. 13. A suspended air cooled furnace wall

temperatures such as the temperatures in shell stills, convection flue gas recirculating tube stills, and shielded flame radiant heat tube stills, insulating refractories give very good service. Insulating refractories possess the qualities of a refractory and an insulating material. Most of them are made to withstand temperatures of 1800 to 200 degrees F., and some can be used with furnace temperatures up to 2500 degrees F. The insulating value of the insulating refractories is somewhat lower than that of an ordinary insulating brick, but is considerably better than the insulating value of fire brick or red brick. A 9-inch wall of an average insulating refractory will have the same heat conductivity as a composite wall of 9 inches of fire brick, 4½ inches of insulation, and 4 inches of red brick. Usually the insulating refractory is protected from the outside by a veneer red brick wall or by a composite wall board.

A wall laid with an insulating refractory has a number of advantages over a composite wall. The weight per square foot of surface of a 9-inch thick wall is less than 50 pounds as against approximately 150 pounds of the composite wall. Therefore, the insulating refractory wall has approximately one-third of the heat capacity of the composite wall, and with the same furnace temperatures and cooling and heating time, a refractory insulating wall is subjected to less strain than the composite wall.

Insulating refractories have an open structure and practically a negligible coefficient of expansion and are less subject to spalling than fire brick. Since expansion and spalling are the main causes of trouble with refinery furnace settings the life on an insulating refractory wall is longer and the upkeep much lower than that of the composite fire brick-insulation —and red brick masonry.

At the present time the progress in generation and application of heat in the refining industry is due mainly to individual efforts of refineries confronted with some particular problem. There is considerable repetition of effort to solve problems that are common to a number of refineries.

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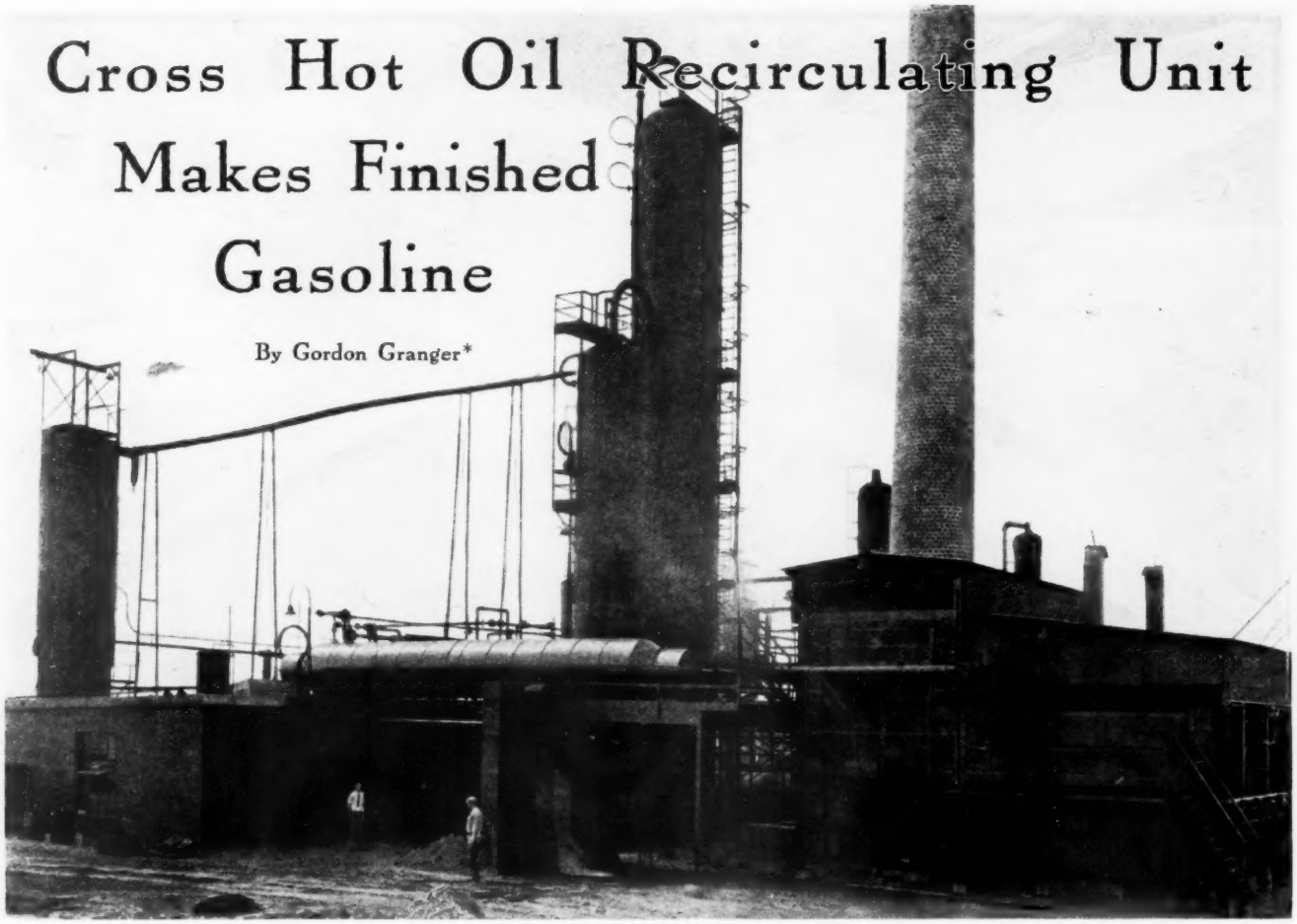
Cross Hot Oil Recirculating Unit Makes Finished Gasoline

By Gordon Granger*



General view Cross cracking unit, Okmulgee plant of Barnsdall Refineries, Inc.

RECENT development in the art of commercial cracking as well as the economic features attached have made it necessary for many of the so-called successful cracking processes to add that piece of equipment known as the high pressure hot oil recirculating pump. Basically, the thought is correct, for high velocities through the cracking zone have always been recognized as the cure-all for those Siamese twins, high coke yields and high fixed gases.

The new installation of the Cross cracking process now used in the plant of the Barnsdall Refineries, Inc., at Okmulgee has incorporated into it the hot oil recirculation system whereby all of the recycle gas oil made in the cracking operations is recirculated through the system, being gradually digested into only two products, namely, gasoline and fuel oil.

The operation of the old method as used by the Cross process in previous years has been excellently described in the literature, therefore I shall confine this description to the new method as now operated.

In Fig. 1 a schematic flow chart shows how the Cross process now consists of four true and distinct operations.

1. The cracking reaction zone.
2. The liberated heat zone where the fractionation and separation of some of the products of reaction take place.
3. The hot oil collection and recirculation feature of this equipment.
4. The added Gray vapor-phase gasoline treating apparatus.

Description of Flow

The Cross plants installed are all of the liquid-phase type, hence the heaviness of the design of this apparatus to withstand the working pressure of 700 pounds and the temperature of 910 degrees F. In the figure as shown, the virgin gas oil starts at a comparatively low pressure as compared to the older units. This pressure is normally from 150 to 200 pounds. It then passes through two heat exchanger coils, respectively located in the top of the fractionating column and evaporator tower, before it takes on its required heat to be considered a suitable blending stock for the returned recycle gas oil from the bottom of the fractionating column 7, arriving together in the accumulator tank 4.

At this point an interesting scheme is worked out toward the holding of a constant level on this hot oil suction tank. The fresh virgin oil line from the two towers is at all times open into the tank but just before this line enters, there is a by-pass controlled by a float level which will allow this oil either to go into the tank or pass on to storage, as the accumulation of the hot recycle stock from the fractionating column gets larger or smaller, this being due, of course, to the refluxing of this latter column.

It is understood, of course, that all recycle oil runs to this tank, and as one's acquaintance with the equipment becomes better a perfect regulation of that incoming virgin oil can be kept from any undue fluctuation due to these primary and secondary reflux controls.

From the accumulator tank the suction of the high pressure hot oil recirculation pump is taken. In the starting of this operation you can see how absolutely necessary it is that a body of oil be maintained for this procedure. This 36 by 5½ by 24-inch duplex Worthington high pressure hot oil pump now charges the combined feed through line 27 through a preheater and convection bank of tubes, thence to the roof and wall tubes and from there passes to the double radiant coil for its completed cracking heat, before passing out of line 19 to the 3-inch walled 41-foot by 38-inch reaction chamber zone.

It is in this latter place that carbon deposition and complete reaction of the hydrocarbon molecules take place in the liquid phase before being partially separated through the pri-

*Superintendent, Barnsdall Refineries, Inc.

Over all Gasdom *and* Oildom

Into the great empires of King Petroleum and Queen Gas go flock after flock of Metric Meters. Continually migrating from their home in the northwest corner of Pennsylvania, these master-measurers answer the call for accuracy coming from every state and country where men are engaged in producing, refining and marketing. To the industry at large and to each specialized branch, they carry a message that means in measuring services simple and sturdy construction; long-lasting, trouble-free operation; minimum attention for maintenance; and concentrated accuracy.

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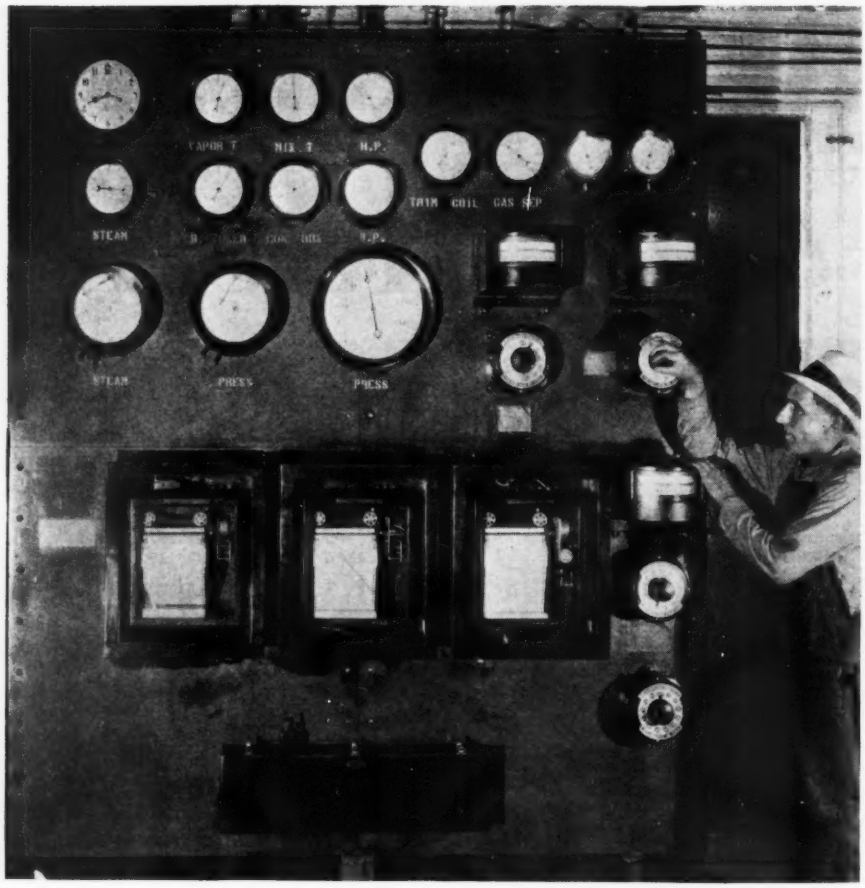


Control board of Cross cracking unit at Barnsdall refinery

mary control valve in line 12 before going to the separating and fractionating phase of this equipment.

As this liquid is expanded in the evaporator column 8 the heat of vaporization asserts itself, vaporizing those portions that are to continue on through the system for re-treating or that that is to be taken out of the system as a finished product.

The liquid of this reaction drops down to the bottom of the evaporator and is drawn off as a finished fuel from the equipment. The vaporized portions, after passing through the fractionating column 7 are now denuded by refluxing, allowing that perfectly fractionated portion known as gasoline, but containing some coloring matter, to pass out of the top of the column and to enter the Gray vapor-phase decolorizing process.

The refluxed portion of this vapor, composing a liquid of higher boiling point composition, flows to the bottom of the column and out to the accumulator tank, being mixed with the incoming hot virgin gas oil as before mentioned.

The partially colored gasoline vapors that go through the Gray vapor-phase tower which contains 8 tons of a diatomaceous earth, pass through the tower at a greatly reduced velocity and are here polymerized. Owing to its highly catalytic absorptive nature this earth completely cleanses the gasoline vapor of its diolefinic material. This cleansed vapor passes on to a de-entrainer 20, out of the line 21, through its condenser to a finished gasoline storage.

The polymerized material now contained in the earth in liquid form flows slowly through this equipment to an open chamber at the bottom, designated as trap 31, where it is picked up by a pump and returned to the fractionating and separating apparatus.

Tests of Products as Taken Daily

Gasoline—	Gravity	56.1
	I. B. P.	98
	20%	206
	50%	296
	90%	394
	End Point	426
	Recovery	96%
	Color	30 Plus
Fuel Oil—	Gravity	12.2
	Flash	200
	Fire	300
	Vis. @ 122°	19
	Cold Test	0
Virgin gas oil—	Gravity	32.5
	I. B. P.	442
	15% off	550
Recycle stock—	Gravity	24.0
	I. B. P.	418
	58% off	550
Combined feed—	Gravity	26.0
	I. B. P.	435
	50% off	550

Cause and Effect

In the four distinct operations the cracking reaction zone remains the same as in the previous installations of the Cross process, with the difference in the heating elements. In the new radiant type furnaces now used as compared with the old convection furnace, the oil is gradually brought up to cracking temperature through four distinct banks of tubes before entering the radiant soaking element located as radiant coils 18 in the schematic layout.

This radiant furnace proper is kept under a slight pressure which allows an even heating of the tubes at all points. This, combined with the new high velocity approaches the more correct process of cracking, making the solids formed pass on to the reaction chamber before settling out. This is quite an advancement, inasmuch as tube failures, scorching and burning out of tubes are now things of the past.

In the liberated heat zone, that is, where the liquid phase products are expanded into the separator and where the separation of the primary products take place, the vapors pass on to the fractionating column, which is a 32-tray bubble tower wherein complete fractionation is made between the slightly discolored gasoline vapors and the recycled heavy material. This tower is equipped with a pyrometric control coil which, when set to give a product of any boiling point range whatsoever, acts automatically at all temperatures and is most dependable on this type of equipment.

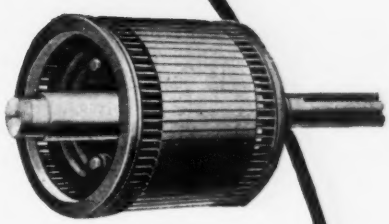
The hot oil taken from the accumulator tank which consists of a combined feed of the virgin gas oil charged to the system, and the hot recycle intermediate oil, each having a gravity of 32.5 degrees and 24.0 degrees Be. respectively, giving approximately a 26.0 degrees Be. gravity with a temperature of 585 degrees F. to 600 degrees F. before going to the furnace.

The high pressure hot oil pump used in this circulation is capable of handling this oil at 1000 degrees F. and 1500 pounds pressure, used either as a simplex or a duplex synchronization when necessary.

In the fourth operation where the completed manufacture of a finished gasoline takes place, a Gray vapor-phase single shell treating tower is used, it having a capacity of 15 tons of de-colorizing clay with a cone bottom screened to hold back the clay and a false bottom as an accumulating pit for the polymerized product of the reaction. It has been found in the operation of the Gray polymerizer in cracking with the Cross process that 10,000 barrels of finished gasoline per ton may be passed through it before the reduction in Saybolt color on the material takes place to the extent that the clay has to be taken out for revivi-

Note the weight of frame, broad heavy feet and compact construction.

The *inevitable reaction* to PRICE!



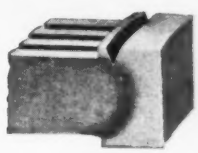
Short, thick shaft; rotor bars and end rings fused into a unit; ventilated core.

The inevitable reaction to price is a separation of buyers into those who can afford to purchase on a price basis and those who cannot!

To those men of industry who know motors—who know that the difference in performance of motors is far greater than the difference in price—who judge and buy motors from a quality standpoint—the Fairbanks-Morse Ball Bearing Motor has always been a "buy."

For this motor is built without compromise. Check it point by point—inspect the superb ***mechanical*** construction which enhances its ***electrical*** dependability.

A few of these points are described on this page. An interesting booklet, "Fairbanks-Morse Motors in all Kinds of Service" awaits your address.



A section of the rotor windings—bars and end rings. Note the complete fusion of the metals. The rotor on every F-M squirrel cage motor has an inspection groove cut in each end ring to make certain of complete solidity.

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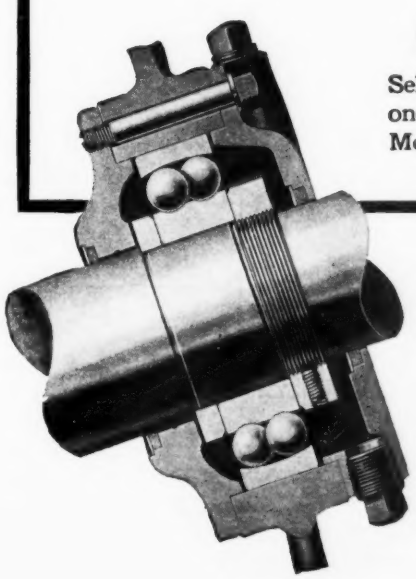
Self-sealing ball bearings require lubrication but once a year. This is further simplified by F-M Measured Grease Lubricant in tubes.



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fication. It is therefore obvious that the operating cost of the Gray method is materially less than that of acid treatment of either pressure benzine or off-colored gasoline, based on inspection alone.

Quality of Products Made

It is becoming more apparent to the refining industry that cracked gasoline refined correctly gives not only a better motor fuel from the standpoint of cleanliness, that is, free of those gum-forming constituents, but that it gives a fuel that will meet 90 per cent of the so-called high compression motor requirements, beside giving a much higher mileage, which in the main is the kind of propelling fuel the majority of the public is looking for.

The gasoline made by the Cross hot oil recirculating process gives one a product that can be safely said to meet all of these requirements, as well as having that even volatility for a year around motor fuel.

The fuel oil from this process will meet all the requirements necessary as a burner material. It has that free flowing characteristic of a low cold test and low viscosity product. The solid matter carried in suspension is practically nil.

It will not clog burners of any type for this simple reason. Being of low gravity the pounds per unit volume are more than all the so-called high gravity fuel oils, therefore more heat units per dollar expended are savings affected by its purchase. This product is gradually taking its place with the other highly refined materials of today's market and will be found in the near future as a leader.

In this new method of operating the Cross process the products derived therefrom have had very little handling as compared with the old system of treating, rerunning and sweetening. All the treatment of the gasoline that is necessary in this late method is merely a sweetening cycle before the product is loaded out for the customer. The fuel oil, of course, needs nothing before its use as a burning oil.

In summing up the advantages gained in the manufacturing of a cracked gasoline in one operation we find that they are manifold, not only in the simplicity of the described operation but by the savings effected by not having to contend with extra investment in acid treatment equipment and rerun stills, which in themselves, as all refiners know, are high-cost producers, caused by the corrosive chemicals, as well as maintenance and upkeep.

Link-Belt to Have Its Largest Exhibit

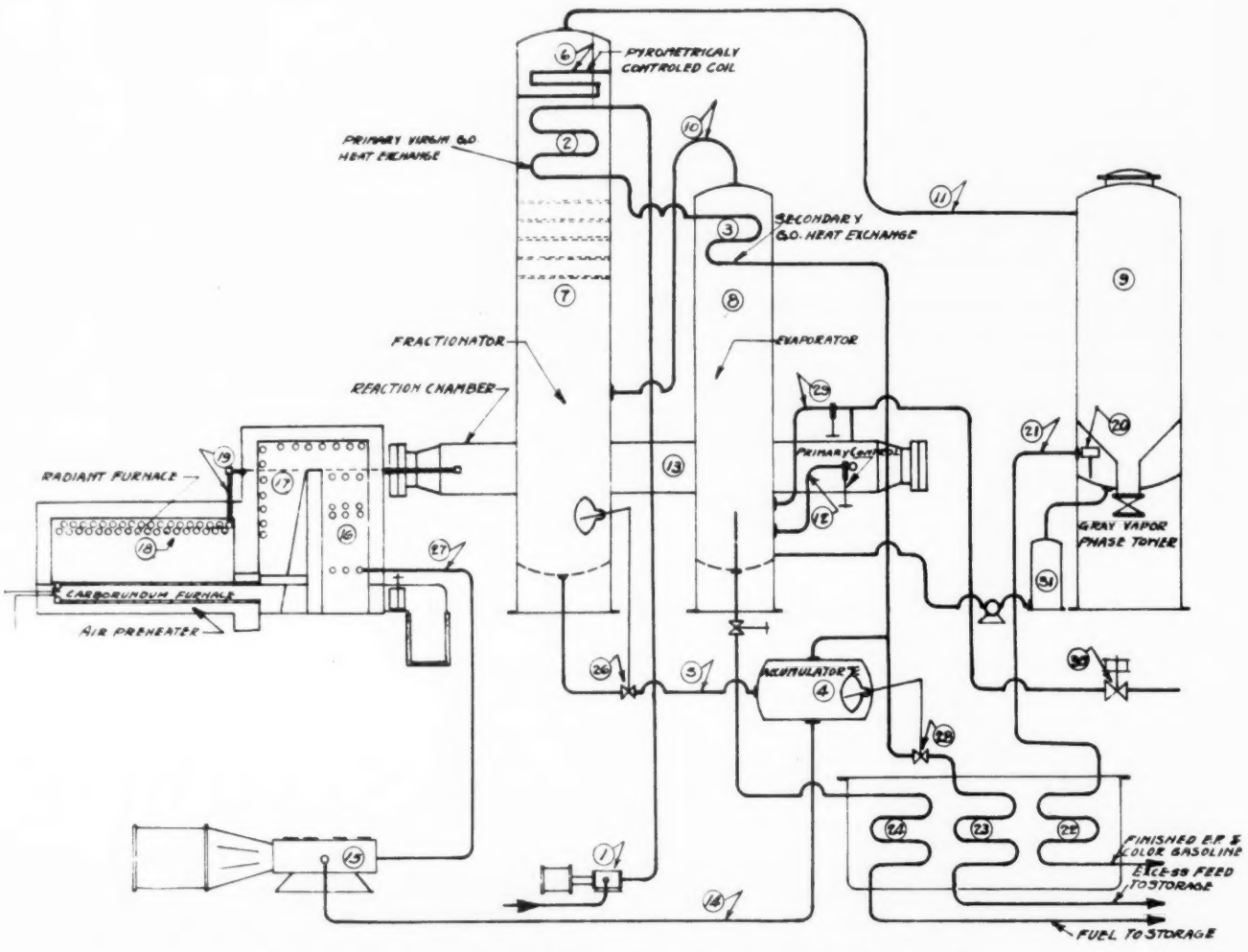
CHICAGO, Oct. 15.—The largest and most varied exhibit it has ever had at any oil exposition will be put on by the Link-Belt Co. at the International Petroleum Exposition at Tulsa, Oct. 20 to 29.

Among the devices it will exhibit will be two Ruf-Nek oil well pumping units, and No. 6 and No. 5, which will be displayed in the outdoor space of the Parkersburg Rig & Reel Co. The No. 6 unit will be in operation.

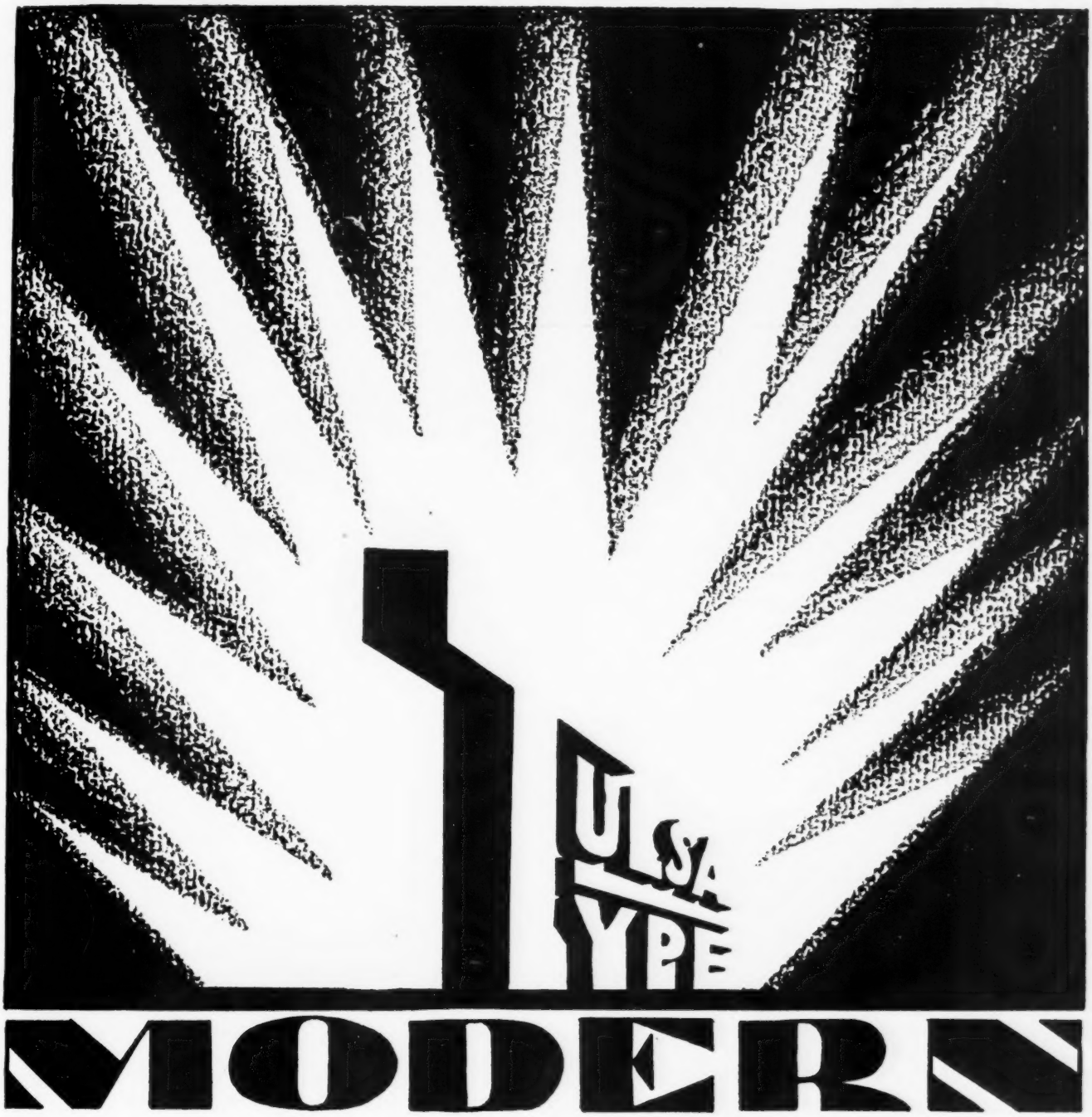
Silent chain drives, Link-Belt roller chain drives, chains for rotary rigs, the Meeseco oil well countershaft, and other products will be on display as well as enlarged photographs showing the company's complete line of equipment for the oil industry.

The silent chain paradox, which is an arrangement of silent chain drives in operation, will also be shown.

Among company officials who will attend the exposition are Alfred Kauffman, president; George P. Torrence, and George Morehead, vice presidents.



Diagrammatic layout of the Cross hot oil recirculation cracking process



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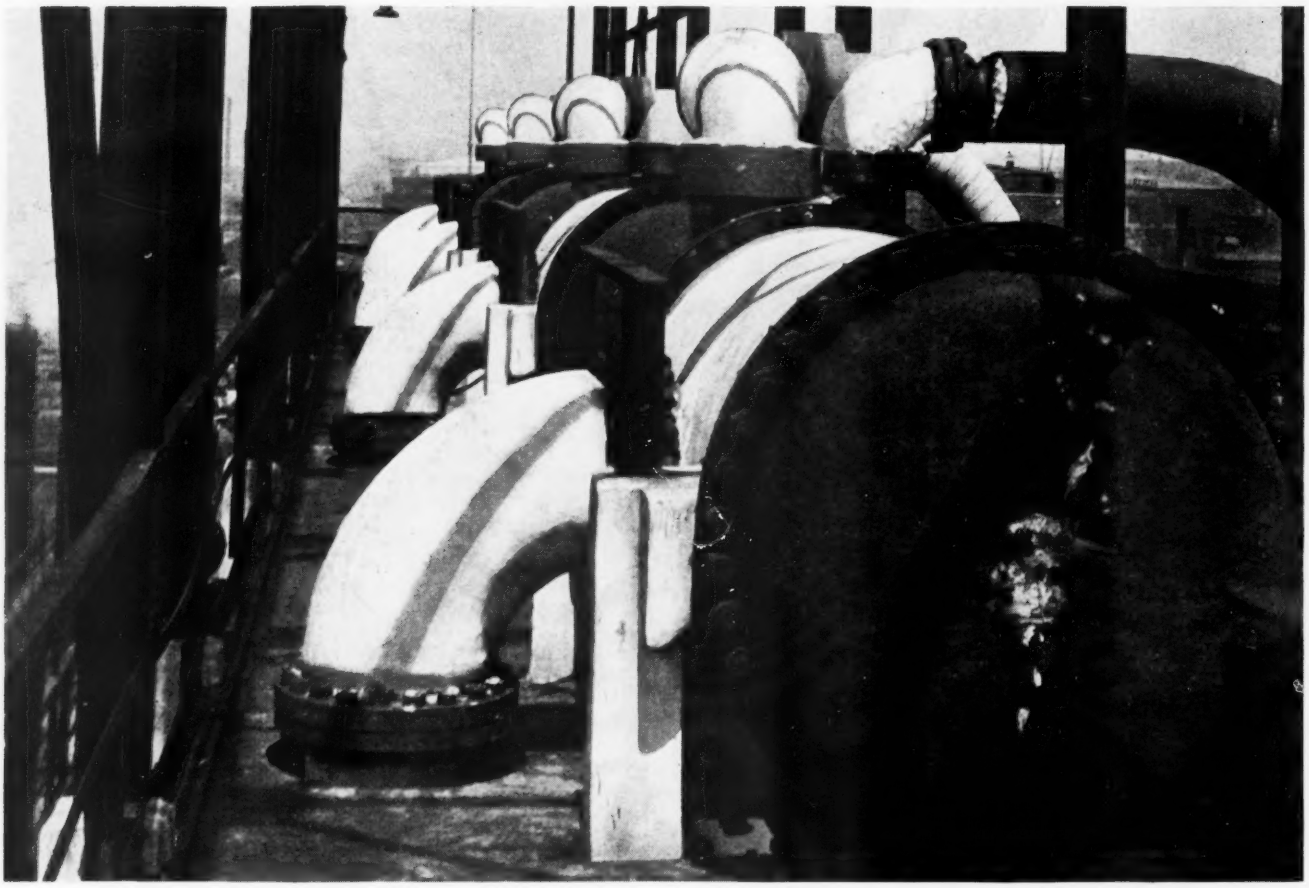
High Pressures and Corrosive Crudes Multiply Heat Exchange Problems

By Robert H. Brinton*



Close up of five Ross partial condensers at Tide Water Oil Co.'s refinery, Bayonne, N. J. The condensers have 1500 square feet of heating surface each. They are arranged for side vapor inlet as shown at left with side vapor outlet on the right. Condensers are giving an actual heat transmission under operating conditions of 47.5 B.t.u. per square foot per hour per degree F. Total preheat 405 degrees F. is obtained

IT IS hardly necessary to point out to the present day oil refiner the changes which the art of oil distillation has undergone in the past few years. Most major industries use processes evolved through a great number of years, but the technique of refining oil has been changed completely, not once, but several times in the past decade.

With the successful application of continuous distillation to crude petroleum in this country is marked the beginnings of the economies that are being effected by the use of proper application of heat exchange. With the old batch methods of operation there was little that could be done toward saving the heat that had to be dissipated to accomplish the necessary fractionation.

Today there are many batteries of stills which have a total heat input to the crude before it ever reaches the feed still of more than 50 per cent. In passing this feed through the residuum exchangers, partial condensers, etc., cooling or separation of the distilled oil has been effected and no inconsiderable saving in condensing water and fuel made possible.

The first heat exchangers had fixed tubes and tube sheets in them. In general these were found to be unsatisfactory, especially when corrosion forced the use of other materials for the tubes than that of which the shells were constructed. These conditions led to the development of what is generally known as the floating head type of exchanger.

In this equipment, which is the most generally used, one tube head or sheet is fixed with the shell and the other head free to come and go with the increase in length of the tubes caused by temperature changes. There are, of course, certain places where exchangers with fixed heads are still used, but in general almost all refiners prefer the cooler with the freely floating head for sad experience has taught them its virtues. These developments led to further changes which resulted in the removable tube bundle. Naturally, with fixed tubes there could be no cleaning of tube surfaces when fouled, but with a bundle of tubes that could be removed, the surface could be cleaned and reinstalled with improved operation.

The natural application of fabricated tube and shell type of exchangers was to cooling the outgoing bottoms with the entering crude stream, recovering valuable heat and doing away with the awkward and inefficient tar coolers. The usual and most desirable type of bottoms exchanger is the horizontal multiple pass exchanger, with a removable tube bundle, placed under or near the condenser box. It is usually considered advisable to

*Sales Engineer, Ross Heater & Mfg. Co., Inc.

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"We have been using Aluminum Paint for eight years in covering tanks containing volatile petroleum products.

"We have found this practice to be very advantageous as it very materially lowers the temperature of the interior of the tanks, resulting in substantial reduction of the losses that otherwise occur. We have had no trouble in securing a good lasting film when we observe the usual precautions necessary to the securing of a good job."

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The booklet — "Aluminum Paint, The Coat-of-Metal Protection"— explains *why* Aluminum Paint reduces oil evaporation and *why* it is more durable and economical than ordinary paint. May we send you a copy?

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split the total surface into several units which allow for continued operation while cleaning, repairing, etc.

On account of high temperatures, most residuum exchangers are constructed with steel shells, either riveted or welded and with steel tubes of sufficient diameter to be easily cleaned. Many engineers lose sight of the fact that exchangers often have to be cut off quickly and may freeze before they can be drained. With small diameter tubes this is serious and may call for replacement of the tube bundle. The opposite extreme for the safety of the refiner is serious for the exchanger designer as he can not secure proper liquid velocities to keep the tubes clean for satisfactory heat transfer.

The old packed towers, air cooled towers, etc., were the forerunners of the modern partial condenser. When refiners found themselves faced with the necessity of increasing their throughputs, the bubble tower was adopted and with it the partial condenser. The present day oil still with the bubble tower and condensers largely eliminates the old time necessity and for run and rerun.

The partial condenser of today receives the vapors as they come from the bubble tower, a mixture of steam and oil vapor. By use of water or cold crude through the cold side of the condenser, separation is secured and the condensed fractions are drained out and through the condenser box for cooling to the house. Control is had by varying the amount and kinds of feed through the tower and here the good designer is not sparing of manifolding for on it depends the successful varied operations of the battery.

The shell and tube condenser of today is an adaptation of the residuum exchanger to a more exacting service. For design, an intimate knowledge is necessary of the behavior of the vapors in the condenser as well as their condensation points.

Usually the object of heat exchange equipment is to cool the products of distillation and not to heat the charge. It is fortunate crude can be used for cooling, but the primary purpose of heat exchangers is cooling, not heating. From purely thermodynamic reasons it is best to use the coldest feed to cool the hottest oil but this is seldom possible.

ROBERT H. BRINTON

What usually happens is the coldest feed comes in contact with the coldest oil for two reasons; first, the coldest and consequently the lightest oils require the greatest fractionation and reflux; second, little or no heat saving could be had from these cooler oils if a heated feed stock were used and certainly only limited control of reflux would be possible.

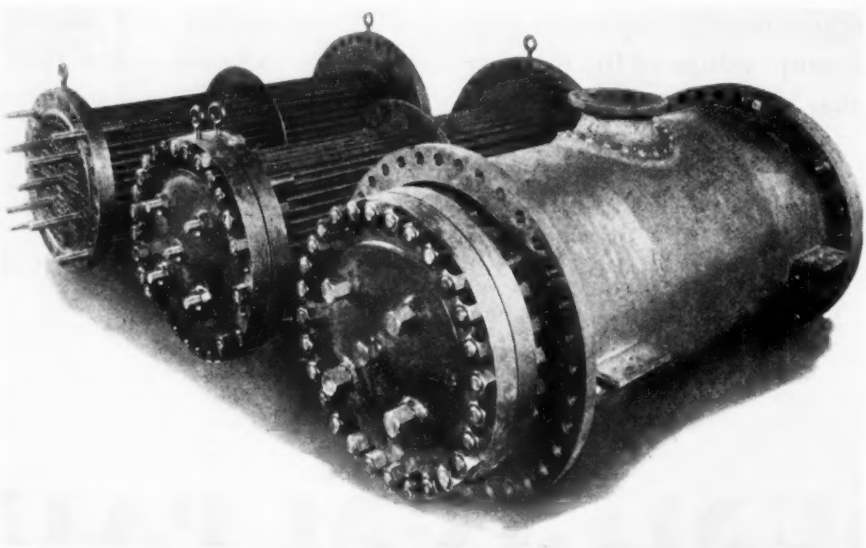
Good practice does not permit of cooling of stocks to closer than 10 degrees to 50 degrees F. of the feed temperature without excessive surface being required. When cooling below these temperatures is required, water is resorted to, with consequent loss of heat for the hot water is seldom if ever used.

The usual path of crude feed is in parallel through the naphtha condensers and in series through the water white and gas oil condensers. Seldom does it get beyond this point for by this time it is so hot as to be of little value as a reflux medium, or it is beyond its vaporization point which may lead to serious vapor trouble unless passed to a still or through a separator. Further cooling must be accomplished by other agencies. Only experience coupled with running plans can decide what is the best and most economic layout of equipment to be had.

Compared to what was done a few years ago, results little short of miraculous can be accomplished by a well designed and carefully manifolded bubble tower and partial condenser layout. We fear, however, that the enthusiasm of some builders and the imagination of users sometimes carry them too far in what they may properly expect in the present development of the art.

In the past few years the cracking art has progressed from one which was almost entirely a discontinuous operation to one which now approaches the continuous. The result has been that today we find applications of heat exchange practice to cracking installations. This has, of course, necessitated greatly increased strength of construction for pressures together with high temperatures.

The result has been that exchanger designs have had to be radically altered to meet these new conditions. Installations are already in operation at pressures over 1000 pounds per square inch and temperatures of 800 degrees to 1000 degrees F. and some plants are already talking of projecting this to 3000 pounds per square inch. Needless to say, these changes require all the ingenuity at the command of a fabricator to meet these new conditions.



Three high pressure reboilers or evaporators for Tide Water Oil Co. showing method of construction. Shell and flanges turned from a solid forging. Shell thickness 1¼ inches. Tubes tested to 1650 pounds pressure; shell to 250 pounds. Tubes 1½ inch outside diameter, No. 10 gauge steel

In the construction of liquid to vapor heat exchangers the problems of materials of construction become acute. Usually such units are condensers, although they may be after coolers, and present problems which are serious. Almost every refinery carries some steam in the stills and this is usually where the trouble starts. The steam, condensing, combines with the sulfur compounds in

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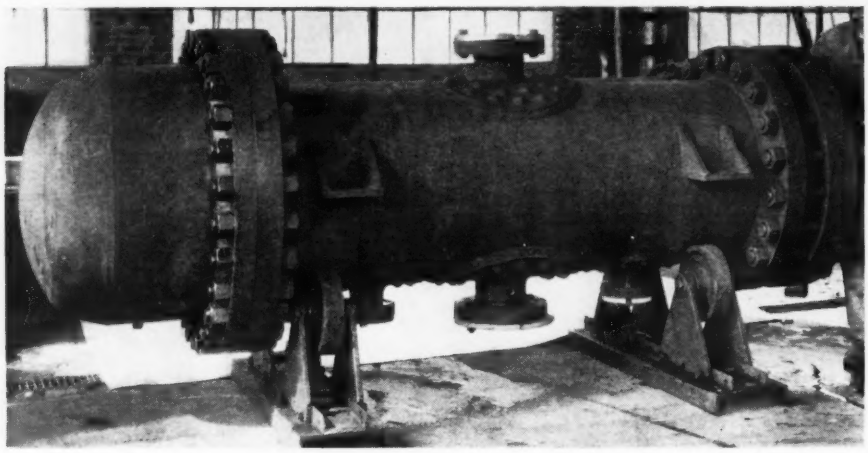
the oil to form sulfurous or possibly sulfuric acid; recombination of decomposed salt may result in hydrochloric acid; the sulfonic and organic acids in the oil may become active; often rerun oils liberate free acids at elevated temperatures. It takes no imagination to realize what destructive effects at the higher temperatures these agents can have on ordinary materials of construction.

Experience has taught us it is useless to use salt and some kinds of fresh water in condenser equipment with steel or iron tubes. Some of the copper-zinc-tin metals are best suited to these services. Crudes heavy with salt are especially destructive of aluminum, if used. Salty crudes if allowed to reach high temperatures are destructive of iron and steel. Hot, wet naphthas usually must be handled with copper-zinc-tin combinations. Wet naphthas from high sulfur crudes are particularly troublesome and can not be handled with materials containing a high percentage of copper. It is obvious nothing but experience can guide one here.



A big high pressure heat exchanger in the shop

The first thought was to turn to cast iron on account of its cheapness and resistance to corrosion generally. Within certain limits the results obtained were excellent but inherent weaknesses due to the nature of cast iron were bound to be present. Tubes, tube sheets, baffles, etc., are often made of Muntz metal, copper, naval bronze, monel metal, etc. These metals all afford varying degrees of resistance to the attack of the various acids as well as the hot oils themselves.

They, too, like the cast iron, have definite limitations due to natural weakness at higher temperatures. In the very recent past the development of crude production in west Texas has brought fresh problems in corrosion, which some designers hope to solve by the use of stainless steels, but to date their cost has been almost prohibitive.

It is folly to install poorly selected and designed equipment for operation; it can only give trouble later. This is best expressed by one executive who says he has to fight for an appropriation but once but he has to fight every day with his equipment. If reasonable care be used and experience followed, the fight with the equipment is minimized, laytime reduced and the battle more than half won.

The use of two metals in the same unit makes all the more necessary the proper provision for expansion of tubes independent of the shell. As discussed previously, at one time almost all exchangers were constructed with fixed heads and tubes, but experience has proven this will only lead to trouble sooner or later and the removable bundle with the freely floating head has resulted. There is no metal or combination of materials that will not, when subject to constant use, become fouled and any type of equipment should be designed that the tubes can be easily removed for cleaning.

In common with all other equipment in a refinery, heat exchange equipment is subject to misuse. This is through no fault of the man who designs it or those who operate it, but owing to the rapidity with which the oil industry has to change its ways to meet new situations arising from production or marketing situations. The intentions of operation of a particular battery of stills are of the best when their design is commenced but the time required for the construction causes so many changes in crude supply, required products, etc., that operations when begun are seldom as originally proposed.

The result is that we can not hope to secure the maximum of results from any equipment we build, therefore the designer usually works to a general average rather than a specific result. Too often, the refiner fools himself in sending out the original specifications on which the manufacturer must quote and the result is unintentional shortage of area, consequent operation trouble which no one can remedy save by a shut down and change of equipment.

Likewise the exchanger manufacturer builds his particular design of equipment to what he feels will be the best layout from specific data presented to him by the purchaser. The buyer should not lose sight of the fact, but too often does, that what he buys is dependent on what information he gives his supplier.

The builders of exchange equipment have through experience, collected general data from which they project their designs, but they can hardly be expected to have full scale refineries in which to test their finished products. This data must come from the oil plants themselves with the cooperation of their managements. Many plants have assisted the builders of their equipment to obtain this information and have secured a great deal of future benefit from it, but unfortunately this can not be said of the majority of cases.

We can predict with reasonable accuracy what can be expected of a proposed layout of exchange equipment but this is done by knowing what similar apparatus has done at other times. There are so many variables to be considered and about which so little is known that it is only by knowledge of previous overall performance that we can be guided. It is obvious that we can have this only by the closest of cooperation between user and supplier.

Like all other equipment in an oil refinery a heat exchanger is supposed to operate continually without maintenance. Why this thought should so thoroughly pervade oil plants we do not know, but it does. If we could but educate ourselves to know and practice that a little time and money spent on cleaning and maintenance would repay itself many times over, we would all find operation much easier.

Again, all too often, the plant designer places the exchange equipment in such a location that there is no chance for easy or convenient repairs. There is no exchange equipment that does not need repairs at some time and it should be located and designed accordingly. Every equipment builder knows within reasonable limits what his material weighs and it can be designed so it can easily be handled in awkward location. Too often it is necessary to erect handling equipment among operating stills which is both hazardous and expensive.

This paper does not permit of going into a detail discussion of the problem of waste heat exchange as found in oil plants. The aim has been to touch in a general way on the subject. Each refiner will have his own special problems which can best be solved by discussion with the manufacturer of his choice.

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LINDE OXYGEN

Problems of Percolating Filter Plant Analyzed and Discussed

By H. R. Lewis

THE problems of filter house operation are so diverse and the scope of activities covered by filter house operation are really of such magnitude that it is hard to prepare a talk covering filter house problems in detail. As a representative of a plant which operates 73 filters, the speaker feels that his knowledge alone is inadequate to shed any light upon numerous difficulties which present themselves in filter house operation.

This paper, therefore, while still inadequate, does not represent the ideas of the speaker alone but thanks to the cooperation of eight plants: The Viking Oil Corp., the Superior Oil Works, Seneca Oil Works, Tiona Refining Co., Conewango Refining Co., United Refining Co., Valvoline Oil Works, and the Pennsylvania Oil Products Refining Co., a composite discussion coupled with general suggestions for the solving of filter house problems, is here presented. This might be called an anthology of filter house problems, as the result of the discussion by the above mentioned refiners of 112 questions covering filtration divided into 18 groups which are in the process of being discussed each week at the regular meeting of the Warren group of refiners.

Wide diversion of opinion concerning filter house operation makes it impossible to state anything but general suggestions in overcoming the problems presented by filtration. What is one plant's problem would not be a problem to another plant or one plant solves a problem effectively in one way and the other plant solves the same problem using another method and perhaps, and it is not uncommon, the theory of the solution in both cases would be opposite.

This paper does not attempt to justify the right or wrong of any one method but it rather attempts to outline safe practice which will guarantee throughput. Suggestions in this paper, if followed, should be carefully checked because the speaker would feel badly if in following any idea that might be gained from listening to this paper, any refinery would lose one gallon of throughput. The discussion as carried on by the refiners mentioned in this paper, covers the filtration of:

A—Solution of 600 stock and long residuum
B—Neutrals
C—600 stocks—straight
D—Long residuum stocks—straight

The Fuller's Earth Problem

Fuller's earth is mainly purchased from the Floridin Co. and the Attapulgus Clay Co. No practical methods of testing fuller's earth are in use and one should be established, for it is known that fuller's earth from the same mine varies from time to time. The screen test for testing the mesh is positive and the weight test discloses that fuller's earth weighs an average of 38 to 40 pounds per cubic foot before burning and an average of 35 to 36 pounds per cubic foot after burning. If a fuller's earth shipment is not up to specifications, in most plants this fact is not disclosed, if disclosed at all, until after the fuller's earth is in the filter and under actual production conditions.

This paper was read by Mr. Lewis before the spring meeting of the National Petroleum Association at Cambridge Springs, Pa., April, 1928.

It can be generally stated with certainty that the finer mesh earth that can be practically used, the better results in both gallonage and color can be secured. The limitations that border the use of finer mesh earth are: loss when burning and handling and slowness in washing and steaming, both of which should be watched when starting to use finer mesh earth.

The usual burners employed to revivify fuller's earth are the Paris, the Rogers, the Kent, the Kuebler, the Eba, the Moore, the rotary kiln, and the Nichols Herreshoff. It is the opinion of the speaker and of those refiners who have watched the operation of the latter furnace, that the Nichols Herreshoff furnace is by far the most efficient furnace for revivifying fuller's earth which is now in operation. In most cases it gives 30 to 40 burns against six to nine burns of the other types.

Natural gas is the best fuel to burn in furnaces used for revivifying fuller's earth, although fuel oil and steam in a proper burner can be used effectively if a large and adequate Dutch oven is provided.

Generally speaking, the temperatures at which earth should be burned are as follows:

First burn on new earth for neutrals 600 degrees F. maximum.

First burn on new earth for straight stocks and solution, 700 degrees maximum.

Second burn up between 900 degrees F. minimum and 1100 degrees F. maximum.

The lower the temperature at which earth can be burned and the longer period at which the earth can be subjected to the lowest practical temperature at which the impurities can be burned out, the better filtration results and the longer the life of the earth can be prolonged.

Burned fuller's earth must be carefully handled to prevent the absorption of moisture from the atmosphere. A slight trace of moisture in earth will cut filtering efficiency greatly. Moisture may be detected by decreased runs and by weighing a given quantity of earth before and after burning to about 300 degrees temperature for about two hours in a laboratory crucible.

It is essential that there should be an adequate excess of burning capacity above the current filter house demand for burned earth. Filter houses represent a greater capital expenditure than furnaces and should be run to full capacity wherever possible at all times, with idle time, if any, on the furnaces supplying the filter house with revivified earth.

There is in most plants a loss or shrinkage of earth when it is burned. This loss is hard to check accurately. The loss of fine mesh earth is, as a rule, greater than on the coarser mesh. The loss of volume is greater when earth is being initially burned because of the presence of fines. It is safe to estimate a loss of 3 to 5 per cent by volume per burn on the present conveying equipment and furnaces in use. This loss is a real problem which presents itself and which can only be solved by intense application on the actual conditions in each plant.

No dependable method of determining when the earth is spent, that is, has lost its filtering power has, as yet, been perfected but much work

is being done along these lines in several plants in the laboratory. Actual gallonage production figures in the filter house usually determine when earth is to be discarded. It is general practice that when earth has lost half of its original filtration qualities it is uneconomical to continue to burn and new earth will give greater production at less cost.

The Conveying Problem

The old type of earth cart has proven its efficiency but has demonstrated its excessive cost of operation and its slowness. In its place in a great many cases has been substituted bucket elevators and belt conveyors which are in general use and are practical.

Pneumatic conveyors collect moisture and powder the earth and have proven unsuccessful in almost all instances, although some small installations are in operation. The conveying problem can be effectively solved for methods of conveying are in use which are fast and which prevent the accumulation of moisture in burned earth. It is essential to get the earth out of the filter and back in the filter with the greatest possible speed.

The Filter Dimension Problem

In attempting to solve this problem, the various refiners are limited by the actual equipment which is in operation. Any change in the dimensions of the filters entails, of course, a large expenditure. It is the opinion of the speaker that there is a proper and most efficient filter for filtering the various grades of oil. What these dimensions should be can only be guessed at in this paper as there is no definite information available, as many plants procure suitable runs on different sized filters. No problem has brought up such a wide divergence of opinion. Almost every operator has his own ideas of the proper dimensions of a filter for filtering a particular oil.

Generally speaking, the depth of a filter can effectively be twice its diameter and give good runs on all types of oil. A filter should have three adequate sized heads; one on the top, one on the bottom, and one on the side at the bottom. The last opening permits easy access by the man pulling the filter. Bolts on all heads should be large, hard and easily tightened. This is most important. Packing should be adequate to prevent leaks when running a filter under pressure.

The Filter Plate Problems

Here again there is a large divergence of opinion and a large difference in the types of plates used in actual operation. Some refiners use a plate which covers the entire bottom of the filter. Others use a plate which covers very little more than the outlet. Some use concave plates, some use convex plates and some use the Fulton filter heads. What plate gives the most effective running conditions and will best solve the filter

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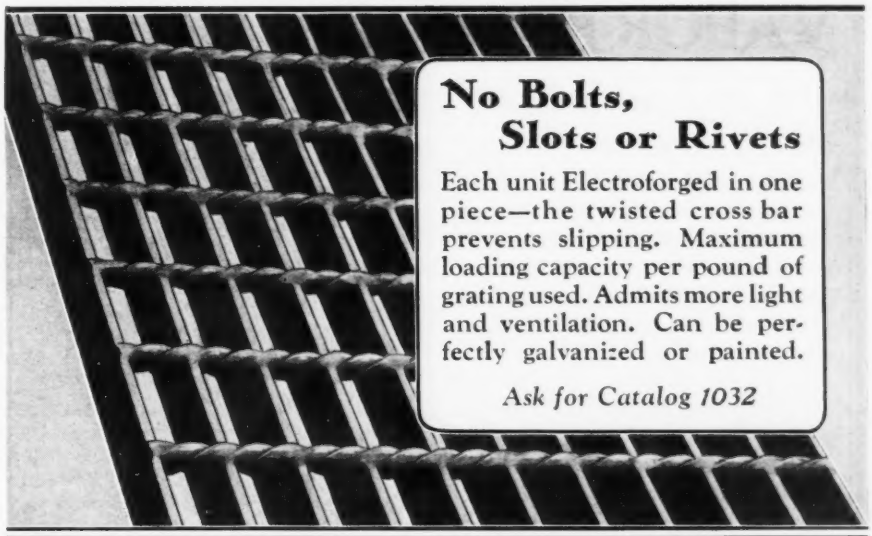

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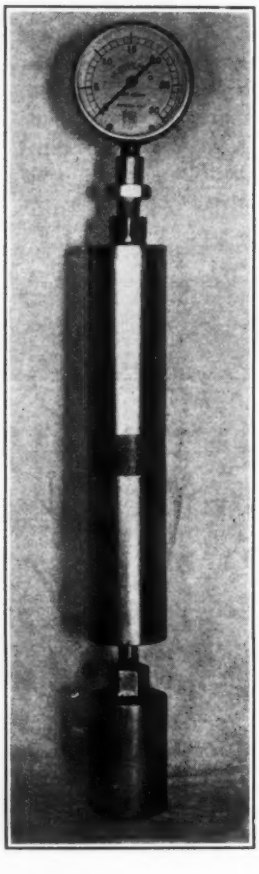

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plate problem, it is hard to state. It is the speaker's opinion that unless the operator favors a plate which covers the entire bottom of the filter that a small plate or a Fulton filter head should be used. Intermediate sizes between the smallest possible plate and a plate which covers the entire bottom of the filter do not seem to be practical.

The Filter Cloth Problem

The cloth most generally used consists of a layer of burlap and a layer of good muslin. Filter cloth costs are excessive in most plants. These cloths should be cut and sewn together to the exact size needed in the filter, as this has proven more economical than squares of burlap and muslin. Several plants are at present experimenting with monel metal cloth which is designed to supplant the use of burlap and muslin. The use of monel metal cloth, if the cloth is handled carefully, is really more economical than the use of burlap and muslin.

Safety Devices on Filters

Each filter house should be provided with regulating valve set at the pressure at which air, steam and oil to be filtered is pumped on to filters, and the pumps feeding the filters should be provided with governors. This is most important as all filters are constructed to withstand a given pressure and if the pressure is increased above the limit set while steaming or running, leaks will result and worse, there may be a hazard involved which would cause injury or loss of life.

Problem of Soaking Filters

When soaking filters the practice in general use is; first, have the earth and the oil pumped on the filters for soaking as near the same temperature as possible. Second, soak under pressure with an air relief valve on the outlet. This will prevent channeling in a great many cases, especially if the filter is soaked and run from the bottom up under pressure. When soaking and running from the bottom up, some plants report an increase in production which is traceable in part to the fact that the filter can be filled completely with fuller's earth and tamped and run out through a plate in the head. The capacity of the earth in the filter when running in this manner is increased about 1/5 with a resulting better run.

Temperatures at which oil is soaked and run through filters is generally with some variations in different plants as follows:

A—Solution of 600 stock and long residuum 110-14 degrees F.
B—Neutrals 80 to 95 degrees F.
C—600 stock 180 to 225 degrees F.
D—Long residuum stock 120 to 145 degrees F.

Application of pressure to the running and soaking of filters wherever

used has proven its efficiency. Some refiners report as much as double the efficiency when using pressure as against gravity filtration.

The pressure at which filters should be run is entirely dependent upon the amount of pressure that the filter can stand, and as far as runs are concerned, it is safe to apply as much pressure as possible guarding against the point, of course, where the earth would be agitated, and the oil pumped through the earth to absorb impurities.

The Problem of Running Filters

In solving this problem first of all it is particularly essential that the operator make out a report from which will show the condition each hour of each filter under his observation. The reason for this is that the time element of soaking, running, draining, steaming, and washing is strictly linked up with the productions which can be expected from the equipment in use. While at times reports of this nature prove irksome to the operators, it is absolutely necessary that an accurate record of each filter be kept if any progress is to be made. The practice of running filters through a hand manipulated valve is slowly going into the discard. In its place a definite sized orifice is being substituted. This orifice makes possible the elimination of the human equation in filtering through a hand manipulated valve.

The results of the use of the orifice give a very even production and result in most cases in a greater production. This paper cannot attempt to suggest the size orifice through which the various filters should be run. The plants that have these orifices in use at the present time have determined size by a process of elimination after using various sizes for various sized filters, from an opening of 1/32-inch up to as high as ¼-inch. The size orifice is dependent entirely upon the size of the filter, the mesh of the earth, the pressure used, and the quality of the oil being run.

The orifice, of course, can be removed when draining the filter. It is bad practice to blend the streams from individual filters in a pipe and run to one finished tank. More modern practice and more efficient practice is to have an individual running tank for each filter and run this filter to a balanced tank.

There are two schools of filter operators: one school claims that more gallonage can be run from a filter if stream is held back and the oil is allowed to go through the earth with relative slowness, the other school claims that the earth has just so much absorbent qualities and that the oil should be run through at the greatest possible speed and the filter drained and re-burned as quickly as possible in order that the process may be duplicated.

Needless to say that if teachings of the latter school are followed, a larger burning capacity is needed and whether a greater gallonage can be procured by the latter method or not is hard to determine. If a happy medium can be struck between the two schools which will put the oil through the earth somewhat faster although not at pump capacity, a possible solution to this problem will be effected. This particular point could easily be the subject of a discussion lasting for quite a period of time and it *should* be discussed for if an excessive burning capacity and a swift running of filters is what its proponents claim, a great many plants are operating filters in an unefficient manner today.

The Re-Run Problem

The theory and practice of re-run on filters is believed to be basically sound. An improvement that is being instituted, however, in many plants is the elimination of a re-run tank by pumping under pressure from the filter which is cut out of the finished stream on to a new filter which is being soaked until the stream from the old filter loses color. At that moment the old filter should be drained. This type of re-run is called in most plants cycle filtration. The application of the cycle filtration theory farther than cycling re-run to a new filter has not been, to the speaker's knowledge, effectively applied. Oil should not be allowed to go below earth at any time during the filtration process, if the filter is run partially full of earth.

Several plants cut a filter out of the finished tank and into the re-run line when the filter stream has reached a certain color, which color, it is assumed, is the color at which the tank into which the filter is running would be balanced. This color sample may be determined on several runs off of the filter into a balanced pan and the cut out sample, as it is called, if used will overcome in part the disadvantage which is present in those plants which do not have a running tank for each filter.

The Draining Problem

After the filter has been cut out of re-run the speed with which it should be drained is most essential. Some plants are draining with air pressure and this has developed into good practice wherever there is not too much evaporation when draining a solution filter by air.

The Washing Problem

There is probably more waste in this operation than in any filter house operation. Some plants use as many as five washes on a filter. If the Nichols Herreshoff furnace is in use, it is essential that the earth be thoroughly washed, more thoroughly perhaps than is necessary in other types of burners.

Washing under pressure is generally practiced throughout the field and washes the filter more effectively and faster than natural washing. Washing under pressure makes possible the elimination of a fire risk, in view of the fact that the head can be kept on the filter while washing under pressure, which means that the head does not have to be taken off the filter from the time that it is ready for soaking until the earth is steamed and ready for pulling.

Clean gasoline should be used for washing with as high an initial point as possible because of the chance for flashes, especially when washing filters that have been filtering stock and also because of the great losses of low initial gasoline. On the other hand, as low an end point as possible should be used in order that the washings may be effectively reduced.

Some plants are putting their washings back into the solution oil which is about to be filtered. This has become general practice although other plants claim that washing should be stilled separately either in a steam or fire and steam still in order to preclude the possibility of putting black oil into green oil which is waiting for filtration. Where the still capacity is available, it is perhaps better practice to reduce washings rather than to put them into solution. A filter should be washed until the gasoline coming from the outlet of the filter is clear and not greasy, although a slight color is present at the end of a wash in some plants.

Some plants alternate washes with steam; that is, they pump the first wash and steam it after the first wash is drained, for an hour or two, and then pump the next wash, in this way keeping the earth hot. They claim that the earth is more effectively washed. The steam used should be very dry because the presence of moisture will hold up the washing of the earth. The gasoline should be heated to within 75 points of its initial before being pumped on the filter for washes. The heating of this gasoline can be effected by making an exchange with steam coming from a filter which is being steamed in the same filter house.

Proper steaming of earth, it can be safely said, regulates in a great measure the run which can be expected from the filter house. Too hot a steam and too great a pressure will, without doubt, injure the earth. On the other hand, too little steam and too wet a steam is just as injurious. A nominal pressure should be maintained and a dry steam should be used. The steaming of the filter should be accomplished as quickly as possible but should not be rushed. The heat loss in steaming a filter is in most plants very great. Improvements along the line of heat exchange using the steam coming from filters should be investigated and perfected wherever possible, as the practice of using water especially in plants that have Sharples or cold settling plants is an uneconomical one, for the steam can be easily condensed by the cold oil from the Sharples and settling plants enroute to the stills.

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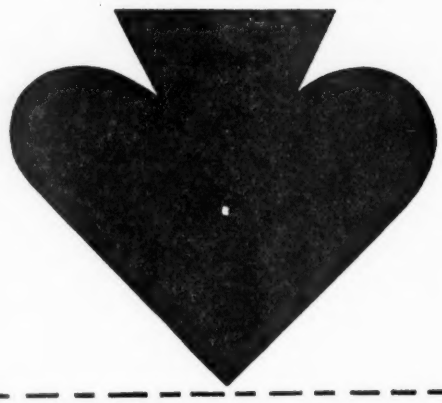

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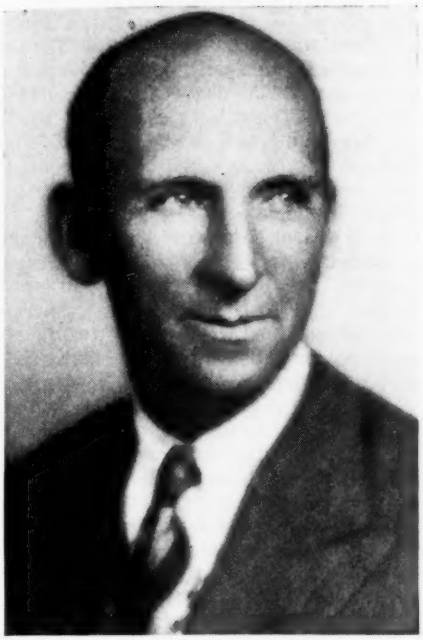
Cooling Problems in Refineries and Natural Gasoline Plants

By W. L. Rifenberick*
and
F. L. Kallam**



W. L. RIFENBERICK

F. L. KALLAM

FOR any gasoline plant or refinery to make production it must have adequate cooling. Of course, there is the other side of the story which is equally important which is—distillation. The latter will not be dealt with in this article. We must in this discussion assume that the absorption, distillation, fractionating equipment, condensers etc. are efficient. With this assumption then, it is necessary to have cold water in order to obtain the required production.

The present day tendency is to make absolutely the maximum production possible, then fractionate the undesirable portions from the products being sought. The net amount of a salable product which is stable is believed to be more when a product is made in this manner than by any other. We must make a stable gasoline instead of the wild varieties formerly sold.

There are two ways of making a stable gasoline. One is to operate the condenser hot and produce a gasoline at that point with the desired specifications. The uncondensed vapors are put through a recompressor where the balance of the gasoline is produced.

This portion of the production is fractionated to obtain a gasoline to meet specifications. The other method is to operate the condensers as cold as possible and fractionate the entire plant production. In the latter case a recompressor is used on the uncondensed vapors and in others it is not. The conditions of each locality dictate whether it is justifiable to operate a recompressor.

If it is possible to obtain an average water temperature of 70 degrees Fahr., it is believed to be cheaper from the standpoint of first cost in an absorption plant to operate the condenser cold as possible and not use a recompressor. The difference in cost between the two sizes of stabilizers will likely be less than a compressor with the attendant equipment required.

This is not necessarily advocated as the best policy to pursue because there are places where with even 70 degree water and 15 to 20 pounds condenser pressure that considerable gasoline will escape.

However, cold water is necessary in either case regardless of whether all the condensing is done in one condenser or whether the recompressor is used to extract the final quantity of gasoline.

By cold water is meant water within 3 to 5 degrees of the wet bulb.

In a refinery the coldest water is needed in the "blow case" condenser and next is the light gasoline condenser. In general the problem of condensing straight run gasoline is vastly easier than in a casinghead plant even though the pressures are lower. The straight run gasoline vapors are not diluted anywhere near to the same extent as the natural gasoline vapors. Were it possible to eliminate these fixed gases in a gasoline plant ahead of the condenser, the problem of absorption gasoline condensing would be materially benefited.

The writers are of the belief that the problem can be helped by the use of a pressure blow case ahead of the preheater. Experiments were carried on by one of the authors in a plant in Huntington Beach in which 35,000 cubic feet of gas per day was removed in a blow case without reducing the daily plant production. The oil circulation was 90 gallons of oil per minute treating 2,600,000 cubic feet of gas per day giving a plant production of 4540 gallons. Such a blow case must be carefully designed and have the proper refluxing or valuable gasoline may be lost.

To obtain the cold water we are discussing the really determining factors, and the ones over which we have no control are the wet bulb and wind velocity. The factor which we can vary is the apparatus used to cool the water and its relation to the direction of the wind. We may use a spray pond, forced draft or atmospheric cooling tower. The first and second are little used except in older installations.

The objection to spray ponds in general is the space required and they have virtually no salvage value in case it is desired to move a plant. The fixed charge of producing the draft is high in the forced draft tower.

The only advantage it has over the atmospheric type is the fact that the quantity of air can be maintained uniform. This feature is one of the uncontrollable factors in the atmospheric type. They, however, are 100 per cent salvagable except for the basin should they be moved. It is this type which we will discuss since it is the one most generally used.

It is the design of the cooling tower and the water load that deter-

*Refinery engineer, Southwestern Engineering Corp.
**Research engineer, Southwestern Engineering Corp.

Table No. I

Effect of Wind Velocity on Temperature of Cooled Water in Atmospheric Cooling Tower*

Test No.	Cooling Water G/M	Temperatures °F. Water to tower	Water from tower	Wet bulb	Dry bulb	Relative humidity	Wind velocity miles/hour
1	2875	85	76	70	77	71	0.5
2	2875	82	72	70	74	82	1.0
3	2875	89	72	72	83	61	16.0
4	2875	85	72	70	77	70	2.8
5	2875	78	70	70	86	43	15.0

Water load—10 g/m/sq. ft. deck surface. Towers 10 deck high.
Example of high temperature water cooling is following:

Temperature water to tower	175°
Temperature water from tower	70
Wet bulb	65
Wind velocity miles/hr.	3
Water load G/m/sq. ft. deck	0.49
Number decks	12

*Data courtesy Fluor Construction Co.—Towers in Mid-Continent.

mines the water approach to the wet bulb.

In order for any tower to be effective it must be so constructed as to give an easy and unobstructed passage to the available air. It must also expose every part of the deck surface to the air on its passage through the tower. If there are parts of the decking that are blanketed then the wood in such a surface might just as well be saved.

Rough sawed decking is equally as good as surfaced decking if not better. It presents greater surface and holds the water on the deck longer. Both are essential to cooling. It does not make much difference what the nature of any cooling problem is, the essential features are surface and turbulence. In the case of a cooling tower air velocity through the tower corresponds to turbulence in a pipe.

In a cooling tower using a single row of boards per deck, approximately 60 per cent of the cooling is done while the water is on these boards and the remaining 40 per cent is done while the water is falling between decks. It has been found that in the case of a double deck cooling tower where it is possible for the air to have free access to all surfaces of the decking that the cooling on the deck surface is increased about 19 per cent. This results in a decided increase in efficiency of the double deck tower over the single deck type.

With cooling towers having overflow distributors at the top of the tower to distribute the water over the decking, considerable difficulty is experienced at times with these distributors becoming fouled or clogged with scale, algae etc., which necessitates the use of daily applications of copper sulfate to the cooling water to destroy the algae growth.

One of the companies operating in California has overcome this trouble and decidedly improved the operation of their single deck cooling towers by the use of spray nozzles in the top of their towers in place of the old wooden launders. In addition to this they have lowered the temperature of the water in the basin 6 degrees when circulating the same quantity of water. The function of the spray nozzles in this case is the combination of a spray pond to remove a large portion of the heat at the top of the tower and then use the tower itself to bring the water in close approach to the wet bulb temperature.

Formerly, the cooling tower would steam very heavily over half the way down during humid weather. But this has been eliminated since the spray nozzles have been installed. The steaming is now only at the top.

Algae growth does not give the trouble it formerly did and neither does scale and sediment. The Marley nozzles keep themselves clean and make a decided improvement in the operation of the towers. In this particular installation the nozzles were located in about the same plane as the distributing launders and point upward. A solid board wall on all four sides has been built to surround the spray nozzles and prevent the wind blowing water out of the tower.

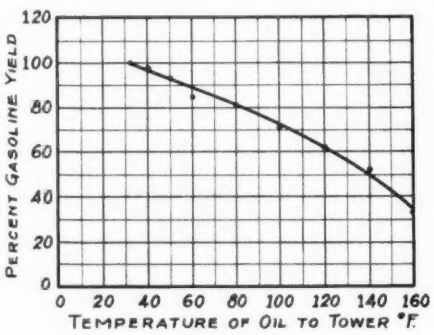


FIG. 2

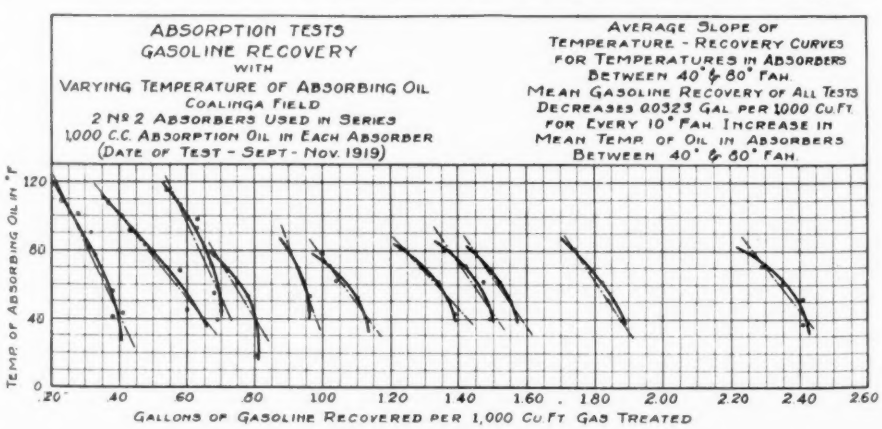
In Table I, results of various wind velocities will be seen. These tests are from five towers all carrying the same water rate and will show the approach of the water to wet bulb as a function of wind velocity. There is also shown a condition of high temperature water cooling or from 175 to 70 degrees Fahr. with a wet bulb temperature of 65 degrees Fahr. The evaporation loss with a tower cooling through such a wide range as this is very heavy, it being about 1 per cent for every 10 degrees the water is cooled.

In a gasoline plant it is difficult to measure the effect of cold absorption oil. Increase or decrease in production due to a change in temperature of cooling water is a result of both colder absorption oil and also colder condensing water. Saturation tests made on absorption oils to determine the increase in gasoline content as a function of temperature are difficult to make and obtain consistent results.

Figure No. 1 shows the results of a long series of tests made on gas varying from .2 of a gallon up to 2½ gallons and temperature ranges from 40 to 120 degrees Fahr. The bulk of these tests were made from 40 to 80 degrees Fahr. Their purpose was to determine the value of cooling below temperatures obtainable using cooling water from an atmospheric cooling tower.

The tests shown in Figure 1 were made using two Ohio Fuel Co. absorbers operating in series. Each absorber contained 1,000 cubic centimeters of absorption oil and the saturation of oil from the first absorber kept within 2½ per cent. The temperature of the absorption oil was maintained constant throughout each test, also all conditions such as rate of gas passed through the absorber, pressure, etc. were maintained constant. During the distillation test all conditions were likewise maintained constant in order that the results would show the effect of temperature of oil on gasoline recovery.

These tests were made on gas in the Coalinga field and will not be the same as tests made on gas in a field containing gas with a large quantity of light fractions. Absorption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GASOLINE RECOVERY
WITH
VARYING TEMPERATURE OF ABSORBING OIL
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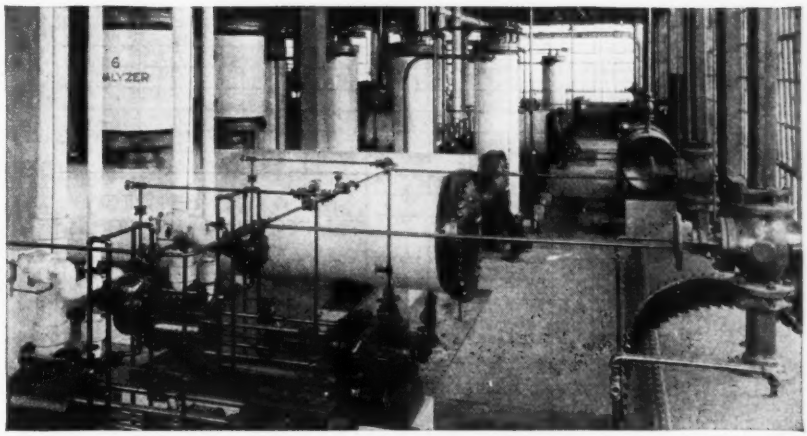
2 Nº 2 ABSORBERS USED IN SERIES
1,000 C.C. ABSORPTION OIL IN EACH ABSORBER
(DATE OF TEST - SEPT - NOV. 1919)
AVERAGE SLOPE OF TEMPERATURE - RECOVERY CURVES FOR TEMPERATURES IN ABSORBERS BETWEEN 40° & 80° FAH.
MEAN GASOLINE RECOVERY OF ALL TESTS DECREASES .00323 GAL PER 1000 CU FT. FOR EVERY 10° FAH INCREASE IN MEAN TEMP. OF OIL IN ABSORBERS BETWEEN 40° & 80° FAH.
TEMP. OF ABSORBING OIL IN °F
120
80
40
0
.20 .40 .60 .80 1.00 1.20 1.40 1.60 1.80 2.00 2.20 2.40 2.60
GALLONS OF GASOLINE RECOVERED PER 1,000 CU FT GAS TREATED

FIG. 1

Here, where economy is measured by results Carbondale *predominates*



600 tons of Carbondale Refrigeration—an absorption system in a large mid-west refinery.

MAKERS of America's finest lubricating oils have been served by Carbondale refinery equipment for more than 35 years. They choose on a cost of production basis, on a basis of economical and dependable operation, not merely for the present but for the years to come.

Carbondale refrigerating and refinery machinery enjoys the confidence of leading refinery engineers because it is as near perfect as engineering skill and experience can make it. Carbondale installations, which are still rendering satisfactory service after more than 30 years of practically continuous use, testify to the type of performance which may be expected.

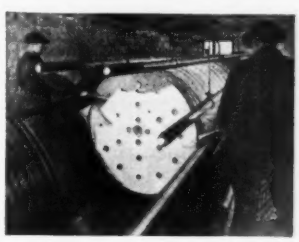
Lower temperatures, better heat transfer, increased capacity —these and numerous other growing demands in the refining field are being solved by Carbondale machinery.

Some of the many types of Carbondale Machines serving the refining industry are described in our Wax Plant Equipment Bulletin. Write for a copy.

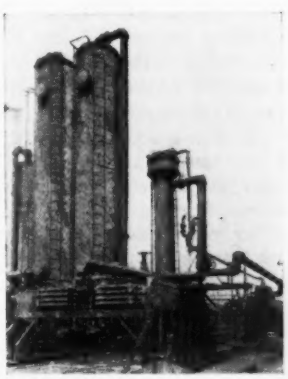
THE CARBONDALE MACHINE CO., CARBONDALE, PA.

Branches in principal cities

For over 35 years Carbondale Chilling Machines have been serving refiners. They are designed, so as to provide for continuous operation and the delivery of a uniform, homogeneous distillate for pressing.



Carbondale Filter Presses and Filter Press Blankets go hand-in-hand in satisfying the strenuous demands of modern refinery methods.



Carbondale Heat Exchanger installation.

Carbondale Refrigeration CARMACO *for Refiners*

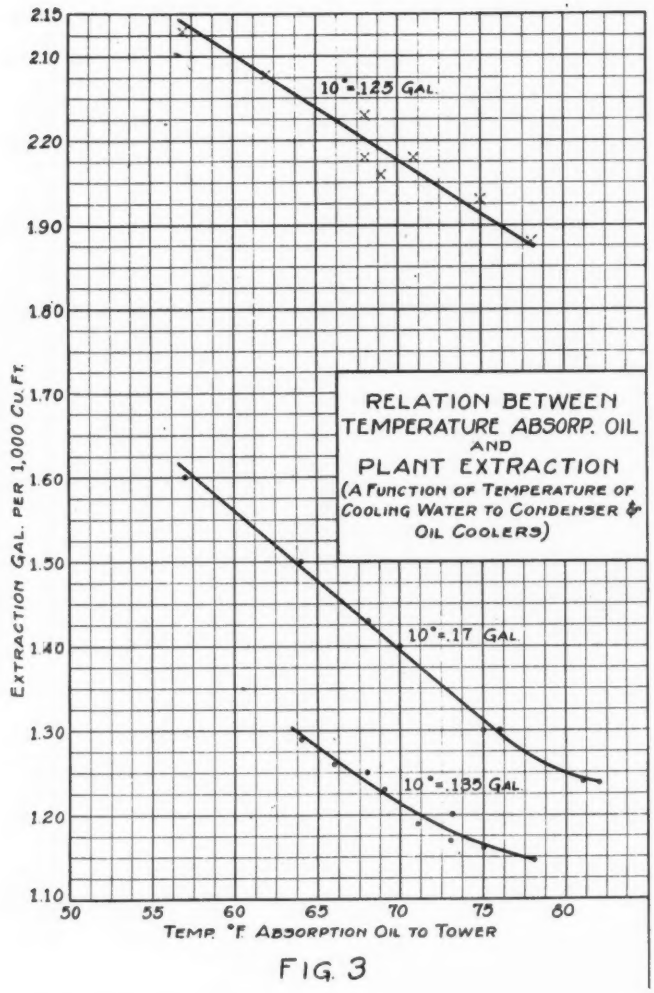

RELATION BETWEEN TEMPERATURE ABSORP. OIL AND PLANT EXTRACTION
(A FUNCTION OF TEMPERATURE OF COOLING WATER TO CONDENSER & OIL COOLERS)
10°=.125 GAL.
10°=.17 GAL.
10°=.135 GAL.
EXTRACTION GAL. PER 1,000 CU. FT.
TEMP. °F. ABSORPTION OIL TO TOWER

FIG. 3

plant production from the wells in this field did not exceed 72 degrees A. P. I. and is an indication that the gasoline consists essentially of heavy fractions.

The effect of cold water is best shown by plant production. Fig. 2 is a graph showing plant production as a basis of temperature of oil to absorption towers. Oil at 32 degrees is assumed to give 100 per cent yield. These temperatures are carried to 160 degrees Fahr. and give an excellent indication of the effect of temperature of oil on production. It is only possible to obtain results of very cold water on plant production in California during periods of low wet bulb and high wind velocities. These conditions usually exist during December.

Figure 3 shows the effect of cold water on plant extraction for three plants in southern California. As previously stated, cold water increases production due to better absorption and better condensation unless a tail gas compressor is used and then the condenser effect is somewhat lost. The plants from which the data were obtained for Fig. 3 were operating without tail gas compressors. In one plant the increase in production was .125 gallons per 10-degree drop in absorption oil or a 10-degree drop in cooling water because the temperature difference between the cooling water and the absorption oil was a constant.

In another plant the 10-degree change in production amounted to .135 gallons per 1000 cubic feet and in the third plant .17 gallons per 1000 cubic feet. These curves cover a temperature range of from 58 to 82 degrees of absorption oil to the towers. The temperature of the water was approximately 5 degrees lower than the oil, due to the coolers being very heavily loaded.

In a plant making about 5,000 gallons of gasoline per day at Huntington Beach, Calif., a series of tests were made keeping all conditions of plant operation constant except the quantity of water to the condenser in order to vary the temperature of gasoline from the condenser to storage. The quantity of water was regulated to give the temperature of the gasoline stream to storage of from 78 to 144 degrees Fahr. Seventy-eight degrees was the lowest temperature obtainable with 76-degree cooling water in a 370-square foot condenser. The production during this test is assumed as 100 per cent. The temperature was raised to 100 then to 121 and lastly to 144 degrees.

The charcoal tests made do not show the true amount of gasoline lost in the uncondensed vapors. This is due to the ineffectiveness of charcoal tests on vapors of high gasoline content.

Fig. 4 shows the variation in production, gravity and recovery of the gasoline and the volume of uncondensed vapors while Fig. 5 gives the Engler distillations of the gasoline produced under the four conditions.

The gas in the Huntington Beach field is somewhat similar to that of the Coalinga field in that it consists largely of the heavier gasoline fractions. The highest gravity obtained with 78-degree temperature from the

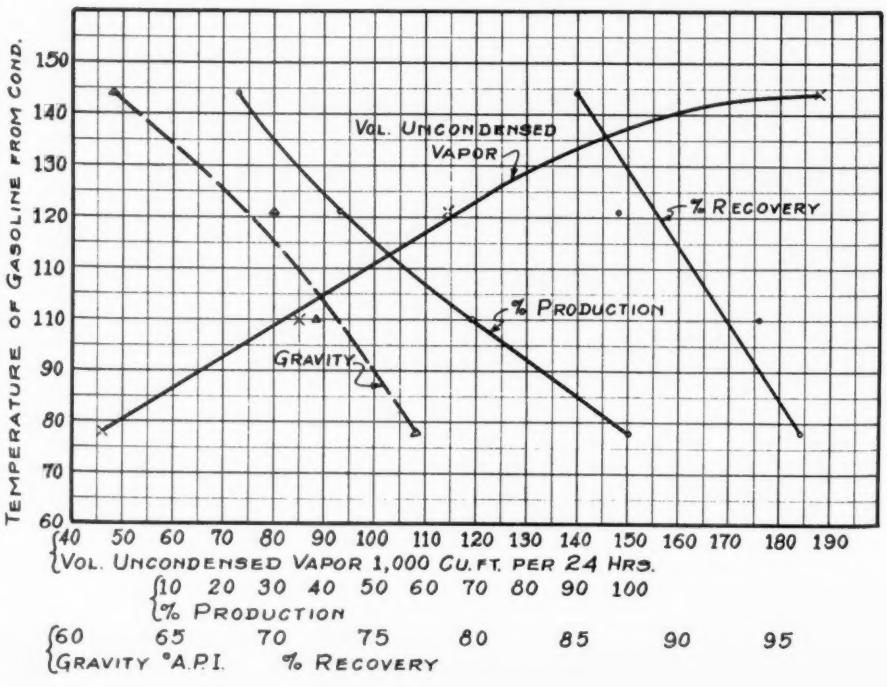


FIG. 4

From an article by C. O. Willson in
The Oil and Gas Journal, September 13, 1928

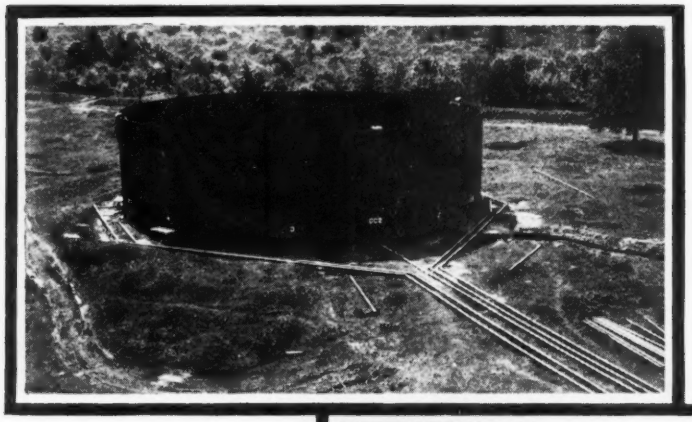
"Fuel prices have slumped to the lowest levels in several years. With the modern cracking unit all of this material is potential gasoline and it is certain that with the cracking operation on a more profitable basis than the straight skimming operation, the trend will be to secure the maximum yield of cracked gasoline which in turn will mean an increase in the percentage of gasoline per barrel of crude oil."

The only way to obtain this maximum yield of gasoline—with resultant maximum refinery profit—is with the Dubbs Cracking Process

Universal Oil Products Co
Chicago, Illinois

Dubbs Cracking Process
Owner and Licensor

The Pictu
STO



1 Almost a thousand barrels of high gravity crude oil were placed in this ninety foot diameter tank. The oil was ignited by drawing a lighted waste torch across its surface from shell to shell.

2 Within a minute the smoke rolled skyward, flames roared, and bystanders hunted cover.

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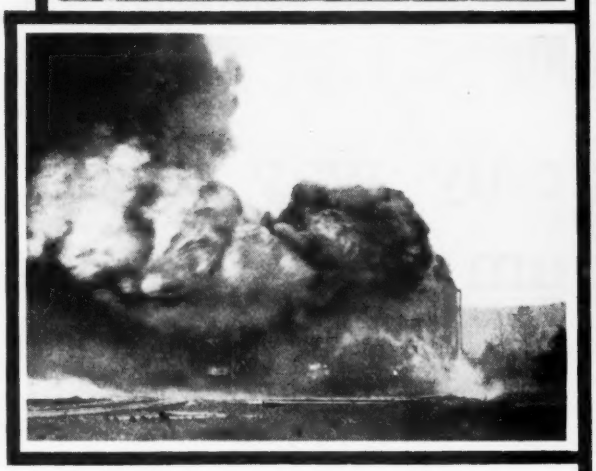
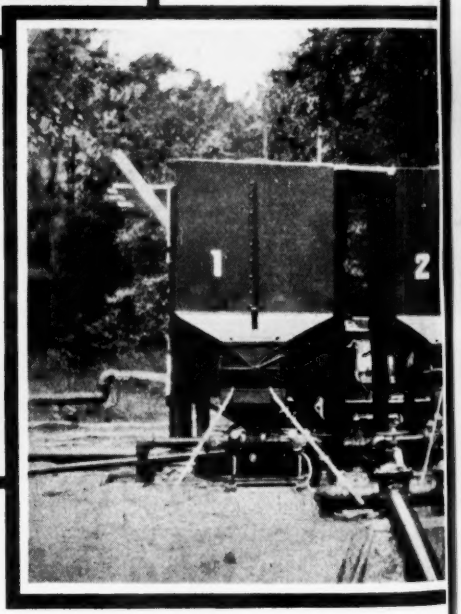


3 In ten minutes the fire, fanned by a twenty mile wind, turned the tank into a seething inferno of flame and smoke.



AMERICAN-LA FRANCE AND FO

A Complete Eng ne
For Extingui

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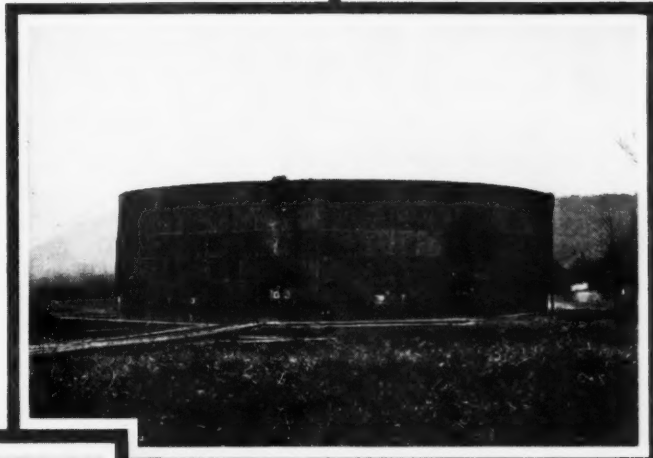


6 Twenty-one minutes from the time the two Generators were started the fire was completely out. Convincing proof of the efficiency of Model 30 FOAMITE Generators to successfully combat large oil fires.

7 The next day a second test was made with the residual oil. In this test the *Firefoam* was delivered nearer the surface of the oil. At the end of seventeen minutes this picture was taken. Then the Generators were put in operation and in the almost miraculous time of fifteen minutes the fire was completely extinguished.

If you want further details of these tests write the American-La France & Foamite Corporation, Engineers and Manufacturers, Dept. E 17, Elmira, New York.

5 Ten minutes after the fire was started two of the FOAMITE Generators were put in operation. And, although the *Firefoam* was purposely made to drop twenty feet through this blazing inferno before reaching the surface of the burning oil, the fire was under control in twelve minutes.

4 These three Model 30 FOAMITE Generators were arranged in parallel so that their outputs could be delivered singly or severally into a common manifold. The three bins supplying the Generators, each had a capacity of 10,000 pounds of Generator Powder.

AND FOAMITE PROTECTION

ng neering Service

ng uishing Fires

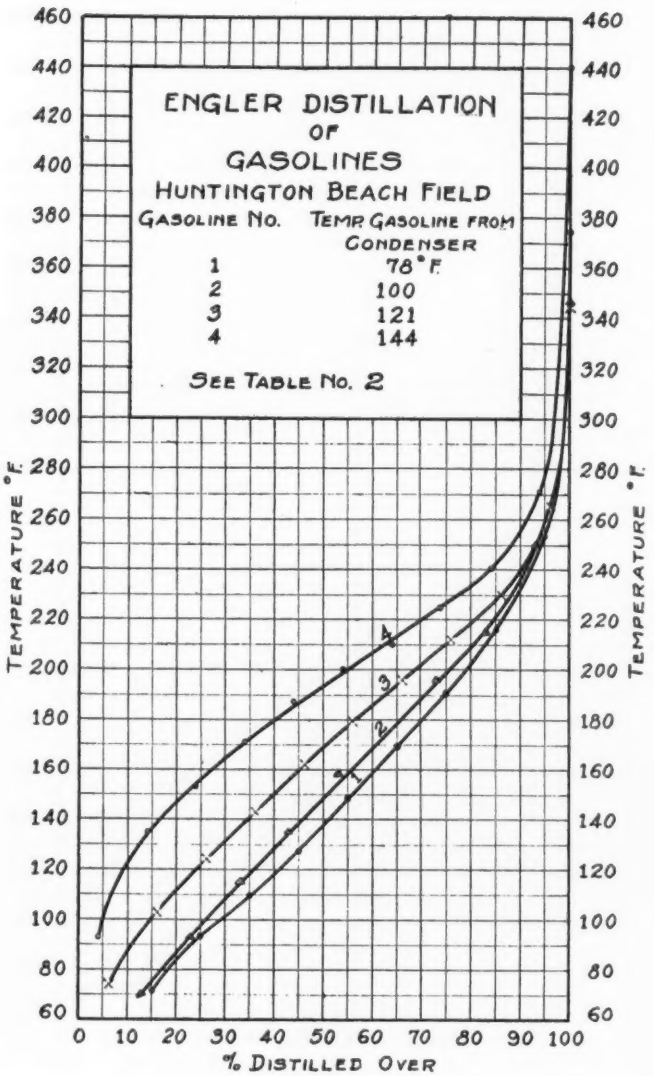

ENGLER DISTILLATION
OF
GASOLINES
HUNTINGTON BEACH FIELD
GASOLINE NO. TEMP. GASOLINE FROM CONDENSER
1 78° F.
2 100
3 121
4 144
SEE TABLE NO. 2
TEMPERATURE °F.
% DISTILLED OVER
0 10 20 30 40 50 60 70 80 90 100
60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460

FIG. 5

condenser was 77 degrees A. P. I. It fell to 62 degrees A. P. I. when the temperature was raised to 144 degrees. At this same temperature the production had fallen from what was assumed as 100 per cent at 78 degrees to 23 per cent at 144 degrees. Between temperatures of 80 and 100 degrees, it would appear that the recovery would decrease 14 per cent for every 10 degrees the temperature of the gasoline from the condenser is increased. That increase is not as rapid above 110 degrees due to the fact that the fractions lost at higher temperatures are more easily condensed. The volume of uncondensed vapor from the condenser seemed to increase in a direct proportion until the temperature of the gasoline from the condenser exceeded 120 degrees; it then increases at a greater rate.

In Fig. 5, which is the Engler Distillation of the gasoline from the plant during these tests, the quality of the gasoline is shown.

The recovery of gasoline from this plant will not show the same variation due to temperature of the condenser as would be the case from a plant in a field containing a larger percentage of light gasoline fractions which are more difficult to condense. The product condensed at 78 degrees would have a recovery of 85 per cent and in some fields for this condenser temperature the recovery would be decidedly lower. A recompressor was not used to condense the gasoline in the vapors from the condenser.

The results shown by the curves presented in this paper indicate the effect of cooling on plant production. In the design of any piece of cooling or heat exchange equipment the basic features must not be lost sight of. They are namely—distance the heat must travel from the surface of the tubing or pipe through the body of materials being heated or cooled, turbulence which is a function of velocity and tubing diameter as well as viscosity of material and length of travel of the fluid through the piece of heat transfer equipment.

One may have a piece of equipment in which the results are poor, due solely to the length of travel through this piece of equipment.

There is a maximum rate of temperature change which can not be exceeded. These factors must be carefully proportioned for each piece of equipment to get the proper rate of heat transfer from a given surface. Plant tests indicate that with all conditions constant except velocity that the heat transfer increases directly as the change in velocity. There is, of course, a limit after which the heat transfer will not increase but this has not been experienced under practical operating conditions.

The heat transfer rate can be decidedly increased over the rates now experienced providing the pumping cost is not a deciding factor.

Table 2
Tests Showing Effect of Gasoline Stream Temperature on Production

(Data Obtained in Natural Gasoline Plant)

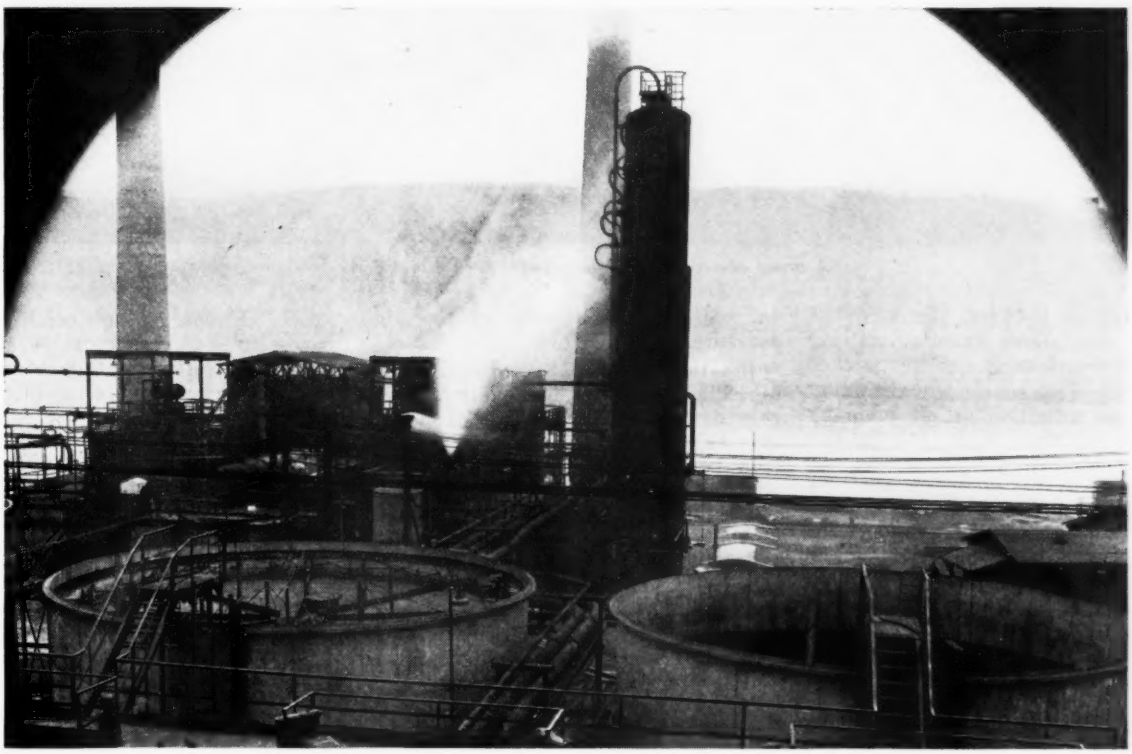
(All Conditions of Operation Constant Except Temperature of Final Gasoline)

Test Number		1	2	3	4
(1)	Pressure on Condenser, P. S. I. Gauge	25	25	25	25
(2)	Temperature Vapor to Condenser °F.	200	203	206	206
(3)	Temperature Gasoline from Condenser °F.	78†	100	121	144
(4)	Gasoline Condensed, Gal. per 24 Hrs.	4494*	3100	1942	1022
	Per Cent	100	69	43	23
(5)	Steam Condensed, Gal. per 24 Hrs.	780*	554	444	427
	Per Cent	100	71	57	55
(6)	Volume of Uncondensed Vapor @ 60° F., M.C.F. 24 Hr.	46	85	114	188
(7)	Gasoline in Uncondensed Vapor as Indicated By 0-Lb. and 32° F. Charcoal Test, G/24 Hrs.	165	387‡	551‡	774‡
(8)	Gasoline in Uncondensed Vapor from Test No. 1 (Items 4 + 8 Test 1 — Item 4)	165	1559	2717	3885
(9)	A. P. I. Gravity of Condensed Gasoline @ 60° F.	77	72	70	62
	Engler Distillation on Condensed Gasoline				
(10)	I. B. P., °F.	71	70	74	93
(11)	10% Over, °F.	93	93	103	135
(12)	20	109	115	124	153
(13)	30	127	135	143	171
(14)	40	148	158	162	187
(15)	50	169	.....	179	200
(16)	60	191	196	196	210
(17)	70	216	215	212	225
(18)	80	253	250	230	240
(19)	90	.....	.....	265	271
(20)	F. B. P. °F.	375	246	345	440
(21)	Recover, %	85	87	94	96
(22)	Residue, %	0.9	1	0.6	1.2
(23)	Loss, %	14.1	12	5.4	2.8

Note: * = Considered as 100%.
‡ = Showing Ineffectiveness of Charcoal Test on High Content Vapor.
† = Lowest Temperature Possible with 76° F. Inlet Cooling Water and 360 Sq. Ft. of Condensing Surface.

Evaporation Loss Has Been Reduced But Can Be Cut Still More

By J. H. Wiggins*



Two floating roof working tanks (foreground) at a Pennsylvania refinery

EVEN ice will evaporate at temperatures below freezing. This fact should help explain to anyone the great tendency for gasoline or volatile petroleum to evaporate at temperatures that are encountered in tanks. Whatever this tendency may be, it is now possible to reduce such loss to a nominal amount and in a practical and economical manner. About $100,000,000 a year is our national evaporation bill today.

The improved methods of and apparatus for the handling of oils have been developed by the companies benefiting from the saving and also by manufacturers of equipment who profit from sales.

Loss in Value by Evaporation

A simple arithmetic calculation will serve to bring home the economic loss sustained for example by a 1 per cent volumetric loss. The producer or storer of crude might say to himself:—"1000 barrels x.01 = 10 barrels. At $1.50 per barrel this is only $15 loss." But at the present rate of 5 cents drop in price per degree A. P. I. drop in gravity, he loses more dollars by the price per barrel route than he does by the loss in volume. A 1 per cent volumetric loss roughly means 0.4 degrees A. P. I. drop in gravity of the whole amount of oil. Considered on the average, this 0.4 gravity drop will affect the price of a barrel of oil to the extent of the price differential per degree A. P. I. If the latter is 5 cents then the loss in price per barrel on the average with a 0.4 degree drop is 5 cents x 0.4 or 2 cents per barrel. This latter figure unfortunately applies to the whole amount of oil that is left. In the above example the original amount of oil is 1000 barrels. The volumetric loss is 10 barrels. The 2 cents per barrel applies to 990 barrels and is equal to $19.80. The $19.80 is in addition to the $15 incurred by losing 10 barrels of $1.50 oil.

Another way to consider this is:—without loss he would sell 1000 barrels for $1500 while with the loss he sells 990 barrels at $1.48 or $1465.20, a total loss in dollars amounting to $34.80.

The $34.80 divided by $1500 gives 2 1/3 per cent. Thus there is another rough rule developed:— For each per cent of volumetric loss there is a 2 1/3 per cent value loss. This is exactly true for $1.50 per barrel crude and a 5-cent differential per degree A. P. I.

Dollars Lost from Large Tanks

The company that has large amounts of oil in storage and a type of tankage which will lose 3½ per cent volumetrically in five years (a gastite steel cone roof rate for light crude) has these facts to face. He will lose 2 1/3 times 3½ per cent or 8.17 per cent of the cost of the crude to him at $1.50 per barrel.

The company which has 5,000,000 barrels of $1.50 oil or $7,500,000 worth, will lose $612,000 in holding it about 5 years.

But one cannot buy oil at $1.50 and pay for tankage, upkeep charges, interest, fire loss and in addition stand a large loss in value by evaporation. To come out even at the end of five years he must sell his oil at about $2.50 per barrel. If this selling price prevails then in addition there is a loss of 3½ per cent times $1 per barrel or 3.5 cents on the 5,000,000 barrels above cited. This is $175,000. The total loss, then, on the $2.50 oil if compared to the price he would have obtained with no loss

*Consulting engineer on evaporation problems.

A group of breather roof storage tanks on a tank farm

is $612,000 + $175,000, or $787,000.

All of the above calculations are simple arithmetic and can be checked by anyone. The reason for bringing them to the attention of oil company executives is that such calculations are rarely impressed upon them. The only argumentative point is the 3½ per cent volumetric loss in the 5 years. In the writer's opinion, for light crude this is somewhat lower than the actual average loss from tankage as it at present exists in the United States. If the loss calculated here be multiplied by any reasonable factor to coincide with the reader's opinion of the actual volumetric loss, he will still have a figure of very interesting proportions. The writer has recently had checks from two sources of about 4,000,000 barrels of storage each, where the loss the first year was about 1 per cent and 1.2 per cent volumetrically respectively—steel cone roof storage.

Methods of Prevention—Standing Loss

The above is of course a strong argument for not increasing storage which is a generally accepted policy at present, more for financial reasons than any others.

It would be of little value to describe what these losses are if it were impossible to go farther and describe how economically these losses could be decreased or practically eliminated. Fortunately the art of storing oil at the present moment has progressed to the point where this can be done.

Pressure Roof—A large proportion of this loss can be eliminated by building a dome roof to be operated at a pressure of about ½ pound per square inch gage. Such a roof will cost about $3500 more per tank of 117 feet diameter. As on the cone low pressure roof, the valve must be sure to operate at a very low differential range and must be perfectly gas tight, even more so than on the low pressure roof in order to reap all the benefits of the high pressure.

Breather Bag—A large proportion of this loss can be eliminated by this device which consists of a fabric balloon placed inside a sheet iron housing and piped to the vapor space of several tanks. This is manufactured by the Goodyear Tire & Rubber Co. The expansion during the day fills the bag and at night this gas returns to the tank. This will cost about $1800 per tank extra on low pitched cone roofs and about $3000 per tank extra on high pitched cone roofs. The writer does not know what their life is.

Insulated Roof—The insulated roof such as installed by Johns-Manville will cost about $3000 more than the plain steel cone roof when placed over steel and about $1,000 less than the steel cone roof when placed on a wood framing. It should show a saving of at least 50 per cent of the bare steel cone roof loss.

Breather Roof—This is a structure which has been in operation a year and a half and stops practically all of this loss—96 per cent or more—whether on motor fuel or light crude. It is manufactured by the Chicago Bridge & Iron Works. A 13 months test on Seminole crude having an initial boiling point of 75 degrees F. and a gravity of 41 degrees A. P. I. showed zero loss in gravity. It is a steel roof which rises and falls daily to take care of thermal changes. No gas is emitted from the vents except a few times per year. It will cost about $1000 more per roof on 117-foot diameter tanks than a steel cone roof. Steel cone roofs already built can be converted to breathers at a cost of from $1500 to $2500 each, depending on local conditions.

On West Texas sour crudes it is extensively used to combat corrosion by filling the tank until the entire under side of the deck is covered with oil, thus eliminating all gas space. Under these conditions the corrosion of the roof is no more than the wetted surface of the shell with a cone roof and this is not great.

Three different methods of greatly decreasing this loss and one method of practically eliminating this loss entirely have been pointed out. Some of these methods cost more to install than others and some prevent a larger proportion of the loss than others. But on a 5-year storage program any one of the above would pay for its extra cost plus a large amount of dividends. Some of them will pay for the additional cost in less than a year. The method to be used should be determined by the engineers of the oil companies.

Losses from Working Tanks

The above discussion was prompted by the existence of so much oil in storage at present, and by the threat of great potential production which if not controlled will enormously increase the volume of storage oil.

Such loss, however, is not the cause of the greatest loss in the handling of oil from well to consumer. The greatest loss occurs in pumping oil into and out of gas tight tanks. For light crudes a single pumping into and out of a tank, the loss will vary from 0.07 per cent to 0.15 per cent of the volume handled thus. In other words, to pump 100,000 barrels of crude once will cost 70 to 150 barrels of gasoline evaporated from the crude with a consequent slight decrease in gravity. The percentage of loss in case motor fuel were pumped will vary from 0.15 to 0.3 per cent for each pumping. Thus the cost of pumping 100,000 barrels once is between 150 to 300 barrels.

The reason for such a loss in gas tight tanks is that the tank acts as the enormous cylinder of a pump and the crude or gasoline surface acts as a piston moving slowly up and down in the cylinder. The result is

that as a tank is emptied fresh air rushes through a small opening in the deck in a stream which is directed at the liquid surface.

Owing to the stirring action of such a stream, the fresh air comes fairly intimately in contact with the oil surface from which it rapidly takes up a volume of gasoline vapor proportionate to its own volume. When the tank is refilled, air and vapor are forced out—hence the loss. A much higher proportion of gasoline vapor comes off gasoline than off crude oil. Hence the greater percentage of loss in handling.

The percentages of loss for a single handling of crude or motor fuel given above have been determined experimentally many times both on a small scale in the laboratory and in the field with 30,000-barrel tanks. This matter has been presented so often that it is well established now.

Crude oil and gasoline are moved from tank to tank many times before the motor fuel is finally delivered to the consumer on the lease once or twice; by the pipe line from 3 to 10 times; by the refiner from 5 to 8 times; by the marketer from 3 to 5 times, a total of from 12 to 25 times.

It is difficult to estimate the loss in each phase of handling this commodity at the present time because there are so many different kinds of equipment which vary greatly in their evaporation prevention efficiency.

In 1919, the equipment was uniform and bad so that an estimate of national loss was a reasonable thing when based on something over a year's work on the one subject. At that time the writer's estimate was 7.7 per cent of the total crude produced, the loss being the gasoline fraction. That was a very conservative estimate.

But that figure applied to about 400,000,000 barrels. A reasonable overall percentage today would be 3 per cent of the crude, but this figure applies to about 900,000,000 barrels of crude or say 27 million barrels of gasoline evaporated annually. At 10 cents per gallon this reaches the still large amount of $113,000,000. With the tankage and methods prior to 1922 handling present day oil, the loss would be at 10 cents per gallon, the staggering sum of $291,000,000. Thus the improvements of the past six years are making in 1928 a saving (over former methods) of $178,000,000.

Fully 2/3 of the $113,000,000 above cited can still be saved.

Prevention of Working Tank Losses

There are two principal methods of attacking this loss. The earliest type installed was the:

Vapor recovery system—This consists of making and maintaining all roofs gastight, fitting them with proper valves and pressure regulators of a very delicate nature, piping from tanks to gas pumps, an absorption

"WE" can paint more than 1000 square feet an hour!

With this great help, your buildings, tanks, pipe lines, cars, trucks, and other equipment can be maintained at a fraction of the cost of hand painting.

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system and more tankage to handle the product.

This system is susceptible of installation only at refineries or large centers of operations. It cannot save all the loss, probably 60 per cent of the total loss would be an average figure. This saving made at a cost of operation plus depreciation and interest on investment lowers the net profit on such an installation still farther. It is often difficult to determine whether and how much profit is made on these plants, because they are generally tied up with a tail gas plant which receives vapors from condensers.

Floating Roof—This device is now generally known, having been in operation in increasing numbers since 1922. In a word, it simply furnishes a steel piston in a tank instead of the liquid surface piston mentioned above. This simple scheme eliminates 100 per cent of all "working" loss and is subject only to a nominal standing loss. On a working tank, therefore, it prevents from 95 to 99 per cent of all loss, depending on how much of the time the tank is used as a worker and how much of the time it is standing still. The actual loss on a tank so equipped is practically a constant and, of course, will show more saving the more the tank is worked.

Perhaps some explanation of such high percentage of saving by the floating roof over the gastight roof is advisable. As an example, a crude "worker" with gastight roof will lose about 2000 barrels per year (a low figure) if it is handling 5000 barrels per day. But if the same tank handled daily 40,000 barrels it would lose about 16,000 barrels per year. Now if this tank were equipped with a floating roof it would lose 75 to 100 barrels per year if handling 5000 barrels per day and only 125 to 150 barrels per year if handling 40,000 barrels per day. In other words, the loss from the floating roofed tanks is practically a constant, regardless of how much it is worked, while the loss from gas tight tanks is practically in arithmetic ratio to the number of barrels pumped in and out. The saving shown in the two examples above is 95 and 99.1 per cent respectively.

Balancing Tanks—Another scheme which has been used in isolated cases is to connect the vapor space of two working tanks together and attempt to pass the gas from a filling tank into the other tank which is supposed to be emptying at the same time and rate. This has proved unsatisfactory.

Summary

Evaporation losses have been greatly decreased in percentage of products handled. But the volume of products has greatly increased. Thus the value still lost is large. But whether a tank is used for storage or as a worker, practically all evaporation loss can now be eliminated at a cost which is only nominal in view of the great saving effected.

Automatic Control in Refineries

By M. J. Bradley*

THE most outstanding tendency of industry today is the rapidly growing appreciation of the necessity for automatic control. The incorporation of automatic equipment to control temperature, pressure, liquid level, flow and to change batch operations into continuous processes is an outstanding characteristic of the present industrial progress.

Numerous and sundry types of automatic devices are available to control every process where automatic regulation is practical. In most instances, an automatic device, if properly chosen and installed, can perform its particular function far more successfully than an operator whose mind is engaged by other duties. In the final analysis, automatic control is the engineer's best assurance that unit production is being obtained with maximum efficiency at a lowered unit cost.

In the petroleum industry accurate control of the temperature is paramount whether the final products are obtained by fractional distillation or the partial condensation principle. The efficiency of the process, the quality of the product and the unit cost of production depend very largely upon the accurate control of the optimum temperature.

Automatic control of the temperature, especially in the petroleum industry, is primarily for the purpose of assisting the operator and making it more convenient for him to control the different variables where they will produce the best results in practical operation. It is not the intention of this article to discuss the various methods of control applicable to the petroleum industry but to outline briefly a few examples, where automatic control of the temperature has been very successful and to describe the operation of the equipment recommended.

Cracking Stills

Uniform and correct temperature conditions are necessary in any cracking process to insure the maximum yield to gasoline. One of the chief difficulties encountered in maintaining uniform temperature is the hunting effects met with in ordinary control devices which cause the temperature of the oil to fluctuate either between limits or to vary regularly through a cycle due to the fact that the control mechanism has a tendency to follow rather than to check the variations in temperature.

In principle this difficult problem has been solved by the use of a double control mechanism which governs the amount of fuel supplied to the burner by combining the effect of a disappearing correction, which is zero at the point of balance, and increasing proportionately with the deviation of the temperature from normal and a permanent correction which sets up a level from which the disappearing correction acts. By this method temperatures may be automatically controlled within a maximum variation of 5 degrees F.

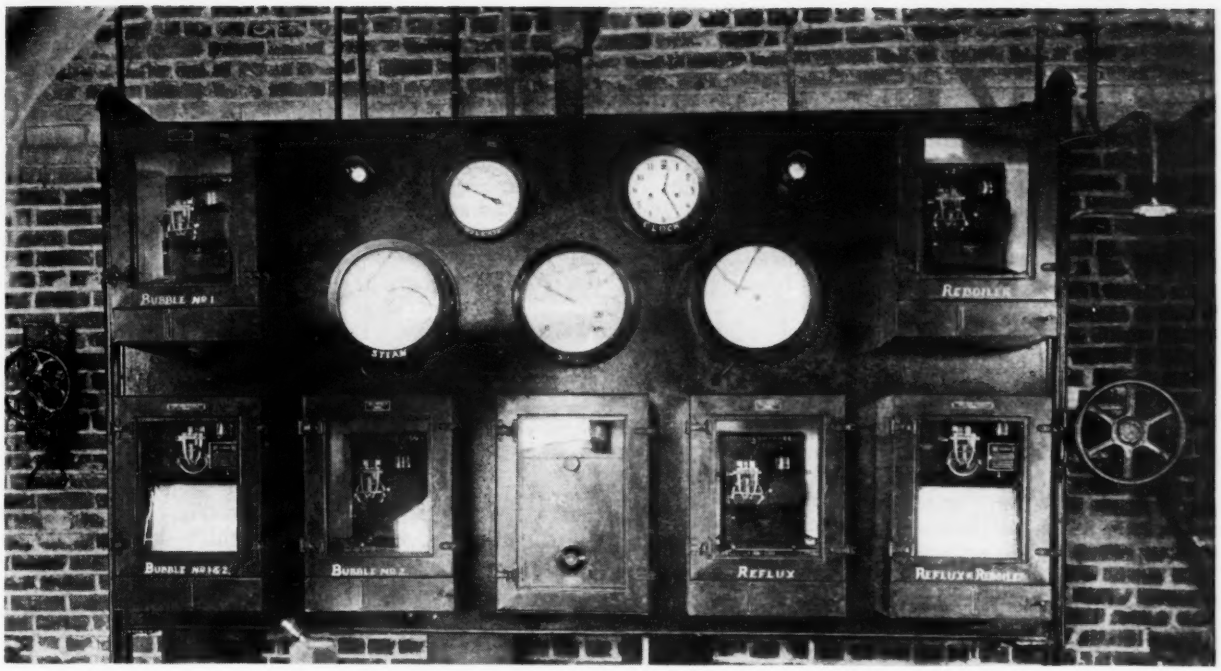
The de Florez temperature control system has been developed to accomplish these results. The equipment consists of a Leeds & Northrup potentiometer proportional step controller and a de Florez control valve which is installed in the fuel line, either oil or gas, leading to the burner which heats the still. The potentiometer controller is actuated by a sensitive thermocouple installed in the oil at a point where it is desired to control the temperature.

The flow of oil by the thermocouple causes the movement of the galvanometer in such a manner that when it deviates from a predetermined point a series of periodic contacts are made. These contacts increase in duration as the galvanometer deviates from the point at which the instrument is set, representing the desired temperature; thus when the galvanometer needle is at a considerable distance from the center position, the circuits are closed a greater length of time than when the galvanometer needle is slightly off center.

When the needle is on center the circuits are entirely open and no corrections are applied.

There are two circuits which are effected, one to correct when the temperature is too high and another to correct when the temperature is too low. The current in these circuits energizes the mechanical device in such a manner that fuel is added

*Development engineer, Leeds & Northrup Co.



A typical automatic control board in a refinery

to or subtracted from the main flow during the period of the contact.

Thus the flow of fuel is increased or decreased in what might be termed a series of small surges which even themselves out in the fuel line to give an increased or decreased amount of fuel in proportion to the extent the temperature deviates from the value set on the controller.

The currents also simultaneously energize a mechanism which might be called an integrating mechanism which tends to change the main flow in the correct direction but will do so only after the minor, or disappearing correction has been in effect for a certain length of time. Thus the combination of these two effects is for the disappearing correction to endeavor to counteract deviations in temperature but if it cannot do so and the corrections are constantly being applied in one direction, the main setting on the valve will be changed and the point of departure for the disappearing correction will be on a new and more suitable level.

The de Florez control valve functions in two distinct ways: First, to maintain a constant pressure at the burner for any given setting, and second, to raise or lower this pressure in accord with corrections initiated by the controller. Thus, the valve action is uniform, regardless of the pressure of the supply line.

The system eliminates hunting and controls the total fuel used by the still. It will act rapidly in case of emergency but at such speed that no undue strains are put on the heating surfaces or the furnace settings.

The fuel control mechanism, which is operated by the controller, has a number of features such as a compensating device for changes of pressure in the fuel line, safety stops for maximum and minimum fuel supply and provision to operate by hand without the necessity of disconnecting the apparatus.

Temperature control in a cracking operation stabilizes the reaction temperature and in turn the rate of reaction and distillation to such an extent that the output of products is constant and fluctuations due to variations in reflex and other disturbing factors are eliminated. In cracking, as in other continuous operations, the deviations from the proper temperature always results in losses.

An increase in temperature will increase the formation of fixed gases resulting in direct loss, while a drop in temperature tends to increase the amount of recycle material affecting the capacity of the still.

Deviations for even a short period of time are detrimental and the main effect of a proper temperature control is to enhance the yields, reduce the carbon formation, and to eliminate the wear and tear on apparatus due to wide fluctuations of fire box conditions which are obtained with hand firing.

The Texas Co. has a battery of 11 Holmes-Manley stills equipped with these control units in operation at the West Tulsa, Okla., plant. Representatives of the Leeds & Northrup Co. will be pleased to arrange for inspection of these units during the week of the National Petroleum Exposition, Oct. 20 to 29.

Fire Box or Furnace Control

Accurate control of the temperature during the distillation of the crude petroleum is just as important as it is during the distillation of the finished products. In each process, accurate control of the heating conditions is essential in order to obtain the maximum yields. Variations of a few degrees from the optimum temperature conditions for the best results may easily result in failure.

Fire box control should give uniform heating conditions to the still or tubes, controlled combustion conditions, within the fire box, and above all oil of a uniform and constant temperature leaving the outlet-coil from the still.

The latter is necessary to stabilize the operation of the bubble tower and to insure products of a uniform character. In order to obtain these results many variables have to be taken into consideration; however, only the two most important will be considered. First, the control of the fuel to the burners and the air-fuel ratio to secure efficient combustion and the proper distribution of the resulting heat to the various surfaces to be heated.

Second, the rate of feed of the crude oil to the tubes or the throughput. The temperature of the crude oil supply to most installations may be held rather uniform and constant by a system of heat interchangers, so that variations due to weather conditions are greatly minimized.

The unerring accuracy and the reliability of the potentiometer method of measuring the electromotive force of a thermocouple is best suited to actuate automatic equipment to control directly the heating conditions and the rate of throughput. The equipment being used successfully at the present time consists of a proportional step potentiometer controller and a motor operated three-position controller to operate the fuel and air valves. Special valves, thermocouples and relays (mounted in vapor

proof boxes) are necessary to complete the installation.

The potentiometer controller mounted in a vapor-proof cabinet is the proportional step type, which means that the control contacts are so arranged that the duration of contact is proportional to the deviation from the desired temperature which is set on the controller. Small or large deviations make corresponding timing of contact, and move the control valve accordingly. This results in a throttling action of the valve.

The three position, motor operated controller is made in various sizes, depending upon the power required to move the valves or dampers for close temperature regulation.

The main part of the equipment is in the three-position switch, the lever arm of which is mechanically moved by the controller motor to one of three positions as the pyrometer makes the various contacts due to temperature changes.

Means are provided for individually adjusting the fuel and air valves for proper combustion at both a minimum and a maximum setting, and this ratio is maintained throughout the valve opening.

When the furnace requires additional fuel, the pyrometer makes its low contact and causes the controller to open the valves to their maximum setting. In response to increase in fuel, the pyrometer shortly makes its center or normal contact so that the valves are *closed* to the mid-opening. If the temperature is rising at a rate sufficiently rapid, the pyrometer will overrun and will make its high contact, causing the controller to close the valves to the minimum setting. When the center contact is again made, but this time on a dropping temperature, the valves are *opened* to the mid-position.

As the center contact is a trifle wider than the instrument stylus, this controller when approaching the center contact on either a rising or a falling temperature, will anticipate the change which is taking place and so adjust the valves that this change is checked *before* the actual holding temperature is reached.

It is claimed that when the valves are properly set for the minimum and maximum opening, the mid-opening will supply fuel and air to exactly meet the furnace demand similar to hand operation, which means that velocity of the furnace gases is a constant, the furnace temperature reaches equilibrium, and the continuous and unnecessary cycle of opening and closing the fuel and air valves is eliminated.

If the heat balance in the furnace is upset from any cause, the controller will automatically slightly open or close the valves from this mid-position and when the furnace again reaches equilibrium, and the pyrometer once more makes its center or normal contact, the controller returns the valves to the mid-opening, and they remain stationary at this position until for any cause the furnace again requires a little more or less fuel.

The complete unit is capable of maintaining constant temperature conditions within narrow limits or regulating the speed of the pumps to supply a constant throughput.

Bubble Towers Are Dephlegmators

In the bubble tower the higher boiling constituents of the hydrocarbon mixture which is traveling upward in the vapor phase will condense at a certain temperature and at a certain section in the bubble tower. In condensing they liberate the heat of vaporization which vaporizes lower boiling constituents which may have refluxed back and causes them to be carried forward. If the vapors pass from the still outlet coil into the bubble tower at a constant temperature, then it is necessary to control the reflux quantity or rate so that the desired fractions shall be confined to their proper sections in the bubble tower.

This means the heating medium and the cooling medium must be accurately controlled in relation to temperature changes. This permits the efficient operation of the towers and produces uniform cuts in the distillation process.

Equipment similar to that described for fire-box control is automatically controlling bubble towers within a total variation of 6 degrees F., and is equally successful in controlling the reflux tower temperatures.

Another equipment which may be used consists of a potentiometer recording controller and a balancing three position controller. Both instruments are being used extensively in the industry so that a very brief discussion of the balancing controller will be given.

The control has two motors, called the initial stroke motor and the balancing motor. If the potentiometer changes from high to low or vice versa, the initial stroke motor quickly moves the operating lever either toward the open or closed position and then a limit switch prevents a further movement of this motor until the potentiometer closes the opposite contact. Thus there will be an immediate effective motion of the valve or valves when the temperature diverts from the normal or desired value set on the potentiometer controller. The initial stroke may be adjusted within narrow limits to accomplish the desired control.

The balancing motor operates each time a contact is made in the potentiometer but it does not necessarily shift the position of the valves because an adjustable timing interval is provided through an idling gear before the clutch engages to move the valve mechanism. This prevents any tendency for the equipment "to hunt". It is evident that there is always a certain time lag which causes a delay in correction of the potentiometer indication after the valves have made the first correction. This time lag is variable, depending upon operating conditions, and it is necessary to wait a certain time (depending upon the lag) before making another adjustment to the valves in order to know whether or not the first correction was sufficient. This is exactly what the balancing control does if properly set for the operating conditions. It waits until the effect of the first adjustment has been registered upon the potentiometer before making a further adjustment.

After the lapse of the predetermined time interval the clutch gear will engage if the temperature is still not back to normal, and the balancing motor will shift the pivoted base of the operating lever in the same direction as the initial stroke, which will open or close the valves additional amounts until the temperature is brought back to normal. Thus a new normal setting may be made on the valves to suit the new temperature conditions. However, the amount of the initial stroke will not be changed.

Walworth to Test Devices For Visitors' Benefit

BOSTON, Oct. 13.—Four booths will house the display of the Walworth Co. at the International Petroleum Exposition at Tulsa. Its extensive line of iron body, steel and brass valves, as well as its tool line and several new products, will be featured.

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HOUSTON, Oct. 11.—Robert W. Stone, formerly vice-president and sales manager of the Freeport Asphalt Co., is now Houston general manager of the Gulf States Terminal & Transport Co., Inc., with offices at 809 Esperson building. In addition to handling cargo quantities of oil, the Gulf States company operates bunker stations at Port Aransas, Clinton, Texas City and Galveston, Texas, and Westwego, Louisiana.

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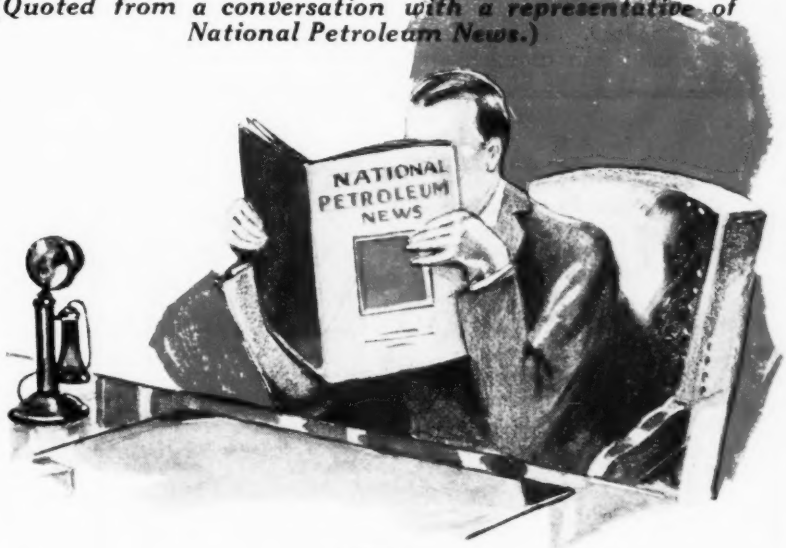

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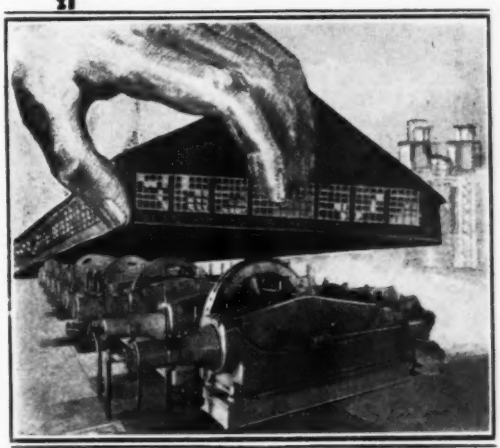

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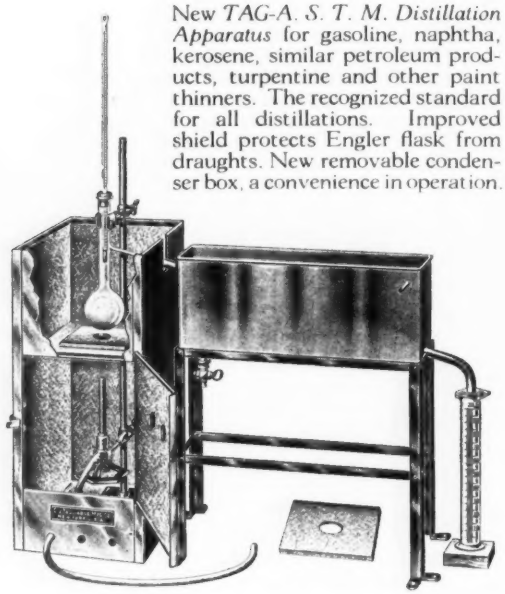

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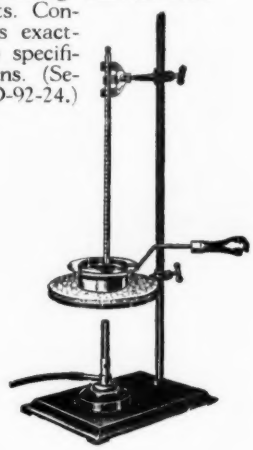

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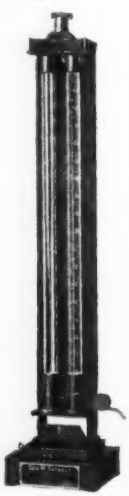

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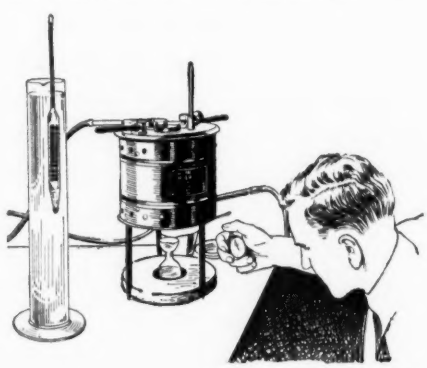

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Electrical Dehydration of Oil in the Comodoro Rivadavia Field, Argentine

By L. D. Wyant*

THE producing horizons in the Comodoro Rivadavia oil fields of the Argentine are lenticular and very thin and in general underlaid with salt water. It is necessary to use extreme care in the drilling of the wells and after they are brought on production, they must be produced correctly. Even with the best engineering applied, the wells that produce water-free oil are the exception. In general, the oil is produced with a water content varying from 5 per cent to 35 per cent.

The oil is of the intermediate type containing enough paraffin to prevent the use of direct overhead distillates as lubricating oils. However, the appearance of the oil, its tar residue content and its reaction to electrical dehydration are very similar to the Gulf coast crude oils. The sulfur content of Comodoro crude is, however, exceptionally low and a gasoline sweet to doctor test and nearly sulfur free is produced direct from the crude.

The crude forms permanent emulsions with its salt water content, particularly wherever the gas lift principle is employed. There is rarely any appreciable amount of free water which will settle out of the crude even on long standing. The presence of water in the crude would never be detected by other means than physical testing or an attempted distillation, except in rare cases when the water content reaches or exceeds 60 per cent. Then the mixture shows slightly yellow. In view of these conditions the dehydration of this oil is the first and most important problem encountered.

So long as the contained water does not exceed 10 per cent, it is possible, and quite satisfactory to use pipe stills for dehydration, especially if cheap fuel is available and also in case the oil undergoing treatment is to be further refined at the same location. However, in this case, when the average water content increased to more than 10 per cent it was found impossible to carry, as latent heat, enough to volatilize the water in the evaporators.

This necessitated a higher temperature at the outlet of the pipe still, resulting in excessive deposition of solid matter in the tubes. This caused considerable time loss for cleaning and demanded an increasingly greater amount of heat, which oftentimes resulted in burning out or permanently damaging the roof tubes of the furnaces.

After taking into account all factors presented it was decided to install sufficient Cottrell high voltage electrical units to dehydrate the oil. Eight such units were purchased and installed. Each two were arranged as a unit so that one motor could operate the agitators of both. The piping and water drains were so arranged that two units could be operated simultaneously, as shown in an accompanying photograph.

Twelve 1,000-barrel units altogether were put in. The last four were installed later as the production increased and all operating data presented herein was obtained on and refers only to the original eight. The original installation consisted of the following divisions:

8 1000 bbl. A. C. high voltage improved H.F. electrical dehydrator units.

2 Worthington triplex outside packed plunger pumps, separately driven with 10 horsepower motors. Size of pumps: 7-inch diameter 8-inch stroke.

1 Parkersburg bolted tank, 250 barrels.

1 100 kilovolt ampere oil-filled electric transformer, 2300 to 230 volts.

1 Exhaust steam heat interchanger, 1500 square feet of bronze tubes exposed heating area. Oil inside the tubes making four passes.

The additional installation consisted of four more dehydrator units, one additional triplex pump and an additional heat exchanger.

Each unit of the electric dehydrators consisted of:

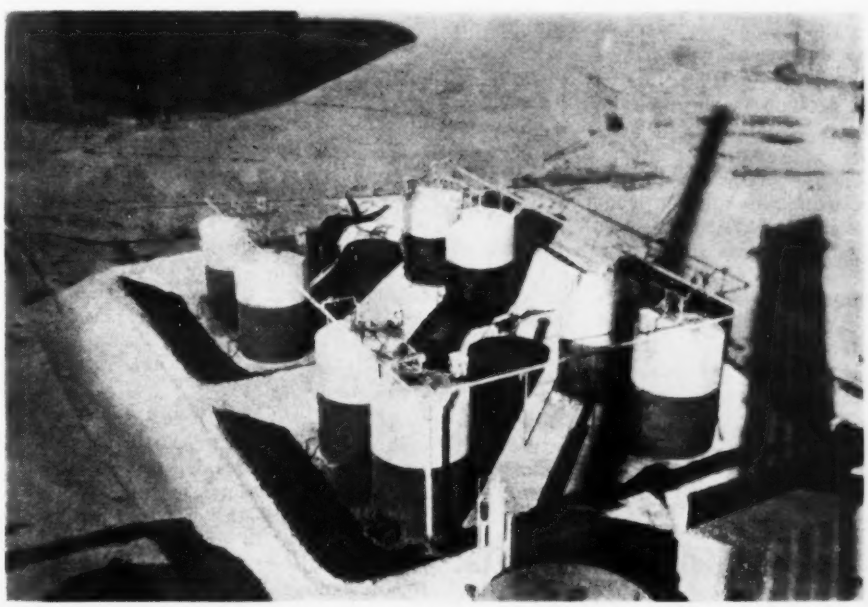
1 10-foot diameter by 12 feet high welded tank. This tank contained the mushroom type electrodes and was provided with its separate transformers, (230 to 11,500 volts) separate switch box, float type automatic control switch, etc. The tanks came in sections, rolled and punched ready for welding.

They were erected and electrically welded near the plant site. The tanks are made of ⅜-inch steel plate and when finished were tested to 30 pounds pressure.

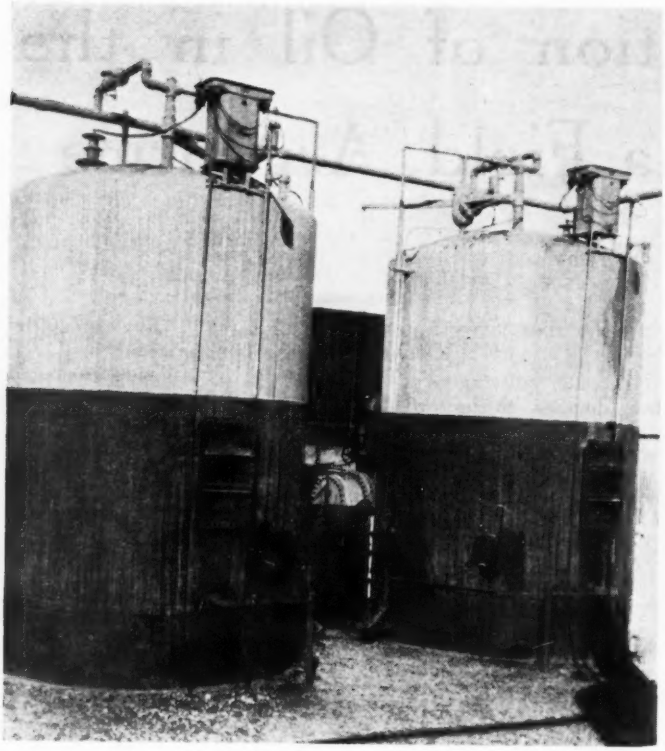
With this type of dehydrator the high tension transformer is mounted on the tank, thus making a neat-appearing unit and necessitating only 4 feet of high tension cable. The general appearance of the finished units is shown in the accompanying photograph.

In the original installation the two Worthington pumps were set but a steam pump was arranged for use in case repairs were necessary. The Worthington pumps gave no trouble, operating continuously. They were furnished with ball type valves and each pump equipped with a Lunkenheimer 3-inch automatic relief valve

*Mr. Wyant built and operated a refinery for British interests in Argentina.



View of eight electrical dehydrators taken from top of 60-foot absorption tower of gasoline plant



View showing two units of electrical plant and one heat interchanger in back. Shows water drains, trycocks H. T. transformers, float control switch, etc.

between suction and discharge valve chests so that an accidental closing of the valves of the system would not subject the pump or lines to undue strains.

The electric current was brought to the plant at 2300 volt 60 cycle, A.C. It was reduced to 230 volts and used for the motors and through the switch boxes of the electric dehydrator units at 230 volts. The part used by the dehydrators was stepped up to 11,500 volts after reaching the respective units.

The exhaust steam used for heating the oil was usually under a pressure of about two pounds above atmosphere and was about 103 degrees C. upon reaching the heat interchanger. The oil was usually about 28 to 30 degrees C. when it came to the heater and left at from 70 to 80 degrees C.

The heavy oil came from the field to a 5,000-barrel tank floating on the line. This tank, in addition to serving as a reserve storage or supply depot served two other useful purposes. The oil as produced contains considerable suspended sand, much of which deposits in this tank instead of being dropped in the heat interchangers. Also, since much of the heavy oil is produced into open earth tanks, any water collected from rains is settled out in the tank, if pumped into the pipe line.

A welded heating coil is placed in the tank and the oil is treated with live steam, this being necessary as the specific gravity of the heavy oil is from 0.950 to 0.965 and often the viscosity of the emulsion is as high as 600 seconds Saybolt Furol at 50 degrees C. The arrangement of the coil is such that the oil is heated only as it is needed for the treating plant.

The light oil, which contains from 3.5 per cent to 7.5 per cent of 437 degrees F. end point gasoline, comes into the treating system through a 6-inch line which connects to this same tank but at a point near the pump. The amount of this production varies from 650 to 1000 barrels per day gross. By taking it into the system in this manner it is not heated until it reaches the heat exchangers and since the plant treats normally 5000 barrels per day, the amount being treated always exceeds the light oil production. This light oil is produced by pumping and any water accumulated is drained from the field tanks before the oil is pumped.

The mixed oil thus taken passes through the heat exchangers and to the separate dehydrating units. The amount of oil is equalized by means of orifice plates located near each dehydrator.

An ordinary mercury U-tube was used in testing the differential pressure across the orifice, except that each leg of the U-tube was fitted with a separate reservoir. Each reservoir was filled with water and care taken always to connect the same side of the U-tube down stream. The water reservoirs served to keep the glass U-tube free of oil and thus clean and legible.

After regulating the size of the orifices to give 12 to 13 inches of mercury differential, separate test samples of the outlet from each dehydrator were taken from time to time in order to check the operation of the individual units. In general, if any unusual condition came about, the voltage on the respective instrument board showed an immediate reaction.

The temperature of the oil was automatically controlled by use of a Foxboro combination recording thermometer and thermostatic control. The temperature was controlled by regulating the amount of condensate leaving the heaters. The temperature varied only a slight amount and due to amount of oil being treated the oil entered the separate units at practically constant temperature. The control was much more desirable than any hand-operated system could be.

After being treated the oil was collected into a common header and taken direct into the pump. Since the oil rarely increased or decreased in the small 250-barrel tank it was found that a gas trap was unnecessary. The hot oil was pumped direct to a line which connected with the tube stills. If the amount of oil exceeded the needs of these stills it accumulated in a 35,000-barrel tank floating on the line. If the requirements of these stills exceeded the supply, additional oil was available from this floating supply tank. In general, no hot oil ever ran into the floating tank, the reason being that an amount of light oil, varying from 600 to 1,100 barrels per day, was produced in a part of the light area practically water free.

This oil came into the floating storage tank line at a point between the storage tank and the entrance of the electrically treated oil.

The most desirable temperature will depend upon the particular oil being treated. It was found that when only the heavy oil was being treated, 80 degrees C. was the best temperature. However, when a mixture of the light and heavy oil was being treated, the best temperature was 65 to 70 degrees C. If 80 degrees C. were used, the current short circuited over the surface of the high tension insulator in the oil, causing severe pitting of the surface.

If the mixture was run at the lower temperature no trouble was experienced. Hence during the 16 hours when mixed oil was being run through the plant, 65 to 70 degrees C. was used, while during the 8 hours that no light oil was being pumped, 80 degrees C. was used.

In normal operation with the two motor driven pumps running, the total plant used 12½ amperes at 2300 volts. This was with a gross inlet of 840 to 850 cubic meters of emulsion per 24 hours—(5290 to 5355 barrels). The average for one month's operation shows:

Oil and water inlet Sp. Gr. .952
Water content 26% (Dean & Starke method)
Oil outlet Sp. Gr. .942
Water content 5.2% (Dean & Starke method)

During this month, a considerable amount of very heavy oil which had been held in storage for a long time was treated. This plant did not reach

STRONG" TRANSIT

MODEL 26, 17 x 24" HORIZONTAL TWIN SINGLE ACTING FOUR-CYCLE
OPPOSED TYPE 170 H. P. 180 R. P. M. GAS ENGINE GAS COMPRESSOR

We are making every effort to see that our new catalogue on this engine reaches every interested natural gas man. If you have not received this catalogue by the time this appears, will you please co-operate with us and send for it, using the coupon.

NATIONAL TRANSIT PUMP & MACHINE CO.
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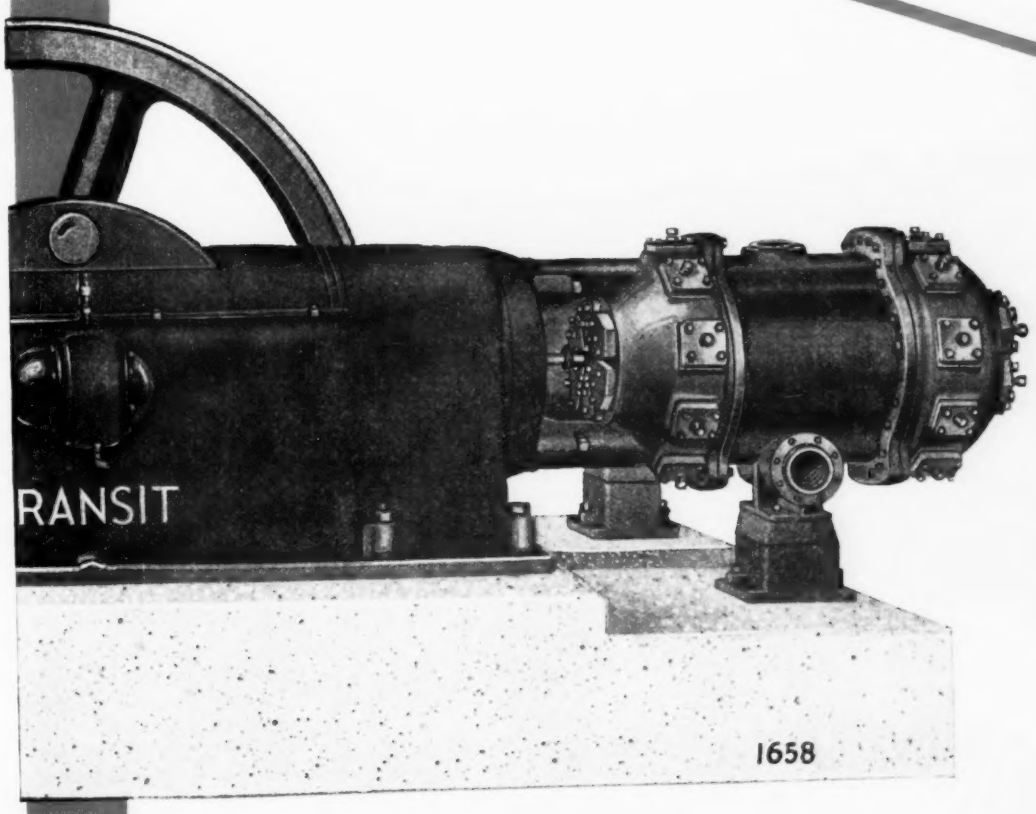

Billions of Bubbles

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STEPPING in the right direction Campbell production travels up, up, on, on! Three-fourths of all California production of natural gasoline is extracted in Campbell-Built Plants. Do you know why?

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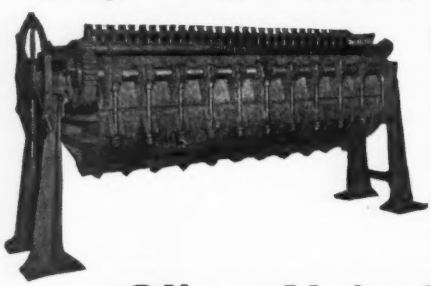
Salvage PbS Recover Doctor Solutions



SPENT doctor solutions—if passed through a Sweetland Filter—provide a double saving.

PbS is recovered and can be sold. The clarified solution can be brought up to strength and used over again.

The only point is what size Sweetland Filter to use. On this point, our nearest office will be glad to advise you.

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anything like theoretical volume but it must be noticed that the material treated was practically emulsified tar instead of oil.

There are several points which could be discussed. In treating this quality of oil it was necessary that the electrodes be placed 5¾ inches apart on center stroke. Set in this way, the eight dehydrators will treat 5,000 to 5,500 barrels per day of oil down to 5 or 5½ per cent water content. If the rate of feed is increased much above this rate it seems the water will not fall out of the oil fast enough, consequently after a few hours the volume of current flowing increases and the voltage decreases until the safety relay switch operates and the unit is put out of operation.

On the other hand, if it is desired to produce an oil of low water content, say, 2 per cent, one must slow down the rate of feed so that the whole plant produces not more than 1200 barrels. That is, assuming of course, heavy emulsion and the same setting of electrode.

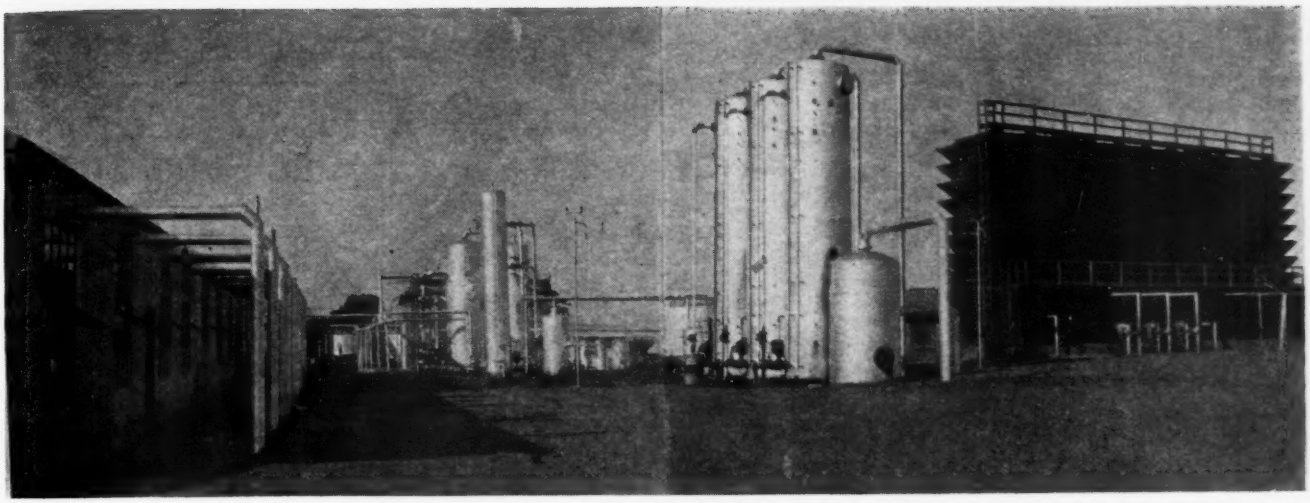
It is believed that if a low percentage of water were desired it would be found best to run the battery in series, setting the electrodes wide on the first units and narrow on the second units and treating the oil in two stages.

However, as first suggested, so long as the water content was 8 per cent or below it was quite satisfactory for our purpose and as a single run system demanded less piping and equipment and less attention from the standpoint of operation the simpler system was used. The question of operating simplicity was very essential with this installation. As operated, the plant was practically automatic except for the regulating of the water level in the respective units, and the changing of the temperature control twice each 24 hours.

Timken Bearings To Perform

CANTON, O.—A mechanical display of the use of Timken bearings, made by the Timken Roller Bearing Co., Canton, O., in transportation and industrial equipment including oil field equipment, will be one of the features of that company's display in booths Nos. 72 and 73 at the International Petroleum Exposition at Tulsa.

Other devices to be exhibited will be a bearing of the type developed for railroad service and successfully used on the C. M., St. P. and Pacific R. R., a steel mill roll neck bearing, and a variety of bearings of types suitable for various kinds of oil field equipment.



General view of Gillespie & Moran gasoline plant, St. Louis field

Economies of Operation Incorporated In Modern Gasoline Plant

By J. C. Chatfield
N. P. N. STAFF WRITER

TULSA, Oct. 11

SIMPLICITY of design and ease of operation are features of the Gillespie and Moran six-unit natural gasoline plant in the St. Louis pool of Pottawatomie county. The plant is the first to be equipped with a new type of gas engine produced by the Clark Brothers Co. The new engines are double acting two cycle units equipped with pressure fuel injectors.

The plant was completed late last spring to handle gas from 18 wells in the Hunton lime development north of the village of St. Louis. Since that time the discovery of a Wilcox sand pool underlying the Hunton and extension of the Hunton production has caused the enlargement of the plant and the building of several other plants in the field.

At present the plant is handling approximately 11,000,000 cubic feet of gas a day from which it is producing about 22,000 gallons of gasoline. Of the gas handled at the plant an average of 4,000,000 cubic feet per day passes through the absorbers under well pressure. The remainder is boosted to normal operating pressures by the compressors.

To produce a high gravity, high recovery natural gasoline of Double A specifications the operators of the plant utilize a system of fractionation of gasoline from the condenser coils combined with recirculation of uncondensed gases from the top of the fractionating column. By this method a high degree of plant efficiency is obtained without the expense of building elaborate multiple column fractionators requiring operation at high pressures.

Rich oil from the battery of three Newton absorbers is distilled in a Tulsa Type vertical steam still equipped with a dephlegmator tower made by the same manufacturer. Modern automatic control devices regulate the temperature of gases leaving the top of the dephlegmator by varying the volume of cold water sprayed over the column. Water accumulations in the base of the tower are trapped off automatically.

Gases from the dephlegmator pass to Griscom-Russell bent-tube sections in a Fluor tower which serves the double purpose of cooling engine jacket water from the hot well and condensing the gasoline stripped from the rich oil.

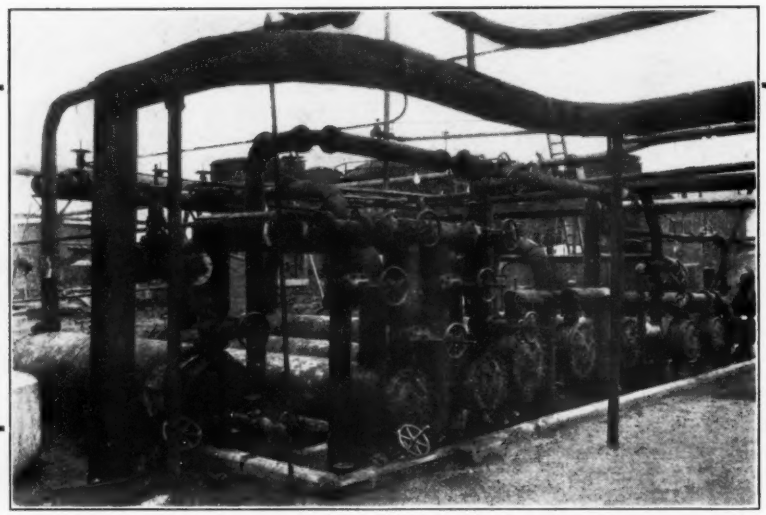
Gasoline condensate from the tower passes through a trap wherein any water which may have reached the coils with the gasoline is separated out. From this trap the gasoline is admitted to the center of a bubble tower fractionator equipped with the customary steam coil at the base for stripping the gasoline of dissolved gases.

The entire distillation system including still, dephlegmator, condenser sections and fractionator are operated under a pressure of about 35 pounds per square inch. The steam coil at the bottom of the fractionator is automatically controlled to provide a temperature of 120 degrees Fahr. in the kettle from which the finished plant product is withdrawn to stock tanks through suitable gasoline coolers.

Uncondensed gases from the top of the fractionating column are conducted to the scrubber tanks through which raw gas is admitted to the plant from the field and are thus recirculated through the system, valuable gasoline fractions being saved and the fixed gases being liberated to the residue. Stock tanks of finished gasoline are kept under a pressure of 10 pounds per square inch with vent lines connected back into the system to recirculate vapors evolved. The operators have found that the control devices, as applied to the continuous distillation, fractionation and recirculation system enable them to keep the plant at the best operating conditions with virtually no attention.

The standard plant product is a gasoline of 86.5 to 87 A. P. I. gravity with a distillation recovery maintained at 91 per cent at the loading rack. Raw gasoline from the condenser coils tested at the scrubber tank just ahead of the fractionating column ranges from 90.5 to 92.5 A. P. I. gravity with a correspondingly lower distillation recovery. Vapor from the top of the fractionating column which is recirculated with raw incoming gas to the plant tests 11 gallons per thousand cubic feet.

The new type engines constitute one of the most interesting features of the plant. The engine room contains two booster units which deliver residue gas to the mains of the Tri-County Gas Co. and four 200 horse-



Typical installation of G-R Shell-and-Tube Heat Exchangers

Shell-and-Tube Types

Special features of design prevent leakage or breakage and assist inspection and cleaning.

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Shell-and-Tube, Atmospheric, and Condenser Box Types
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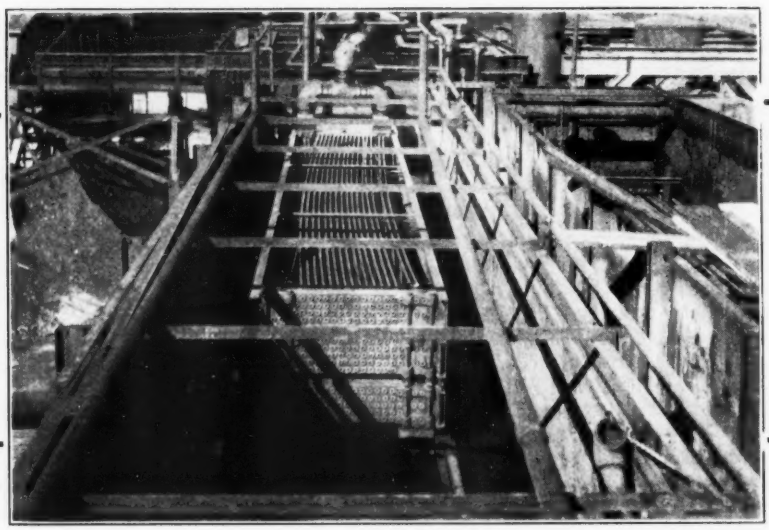
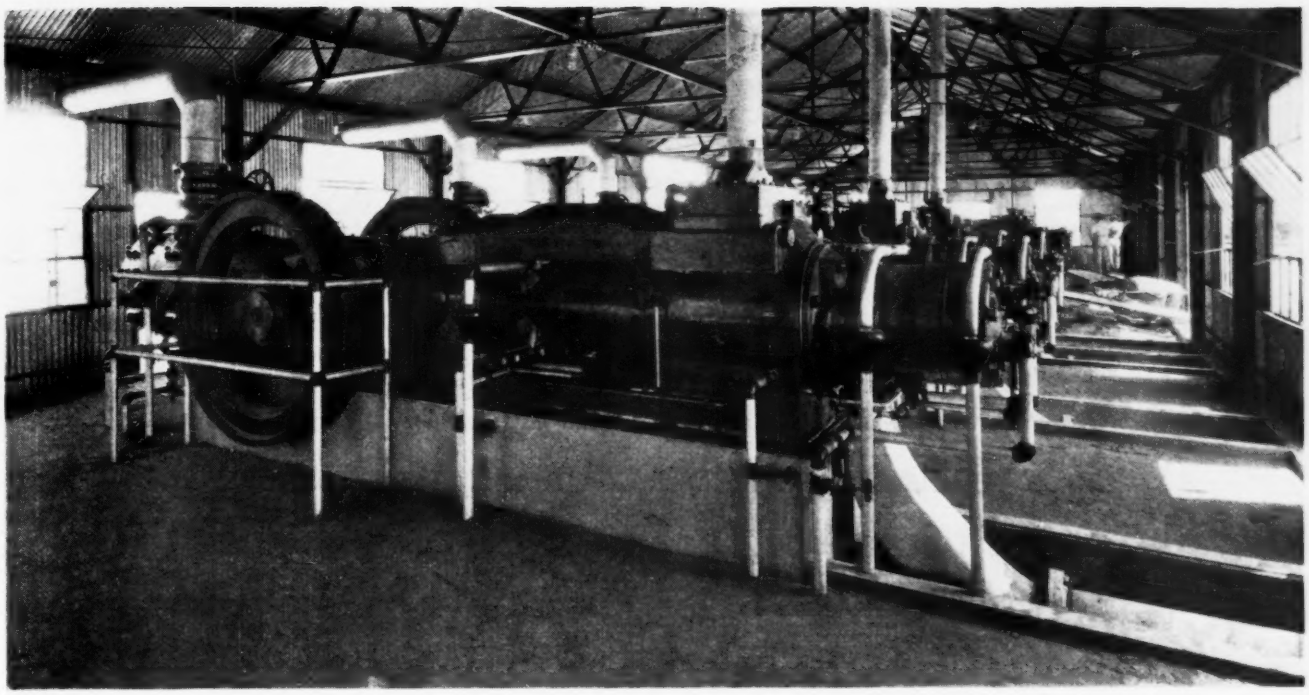


Bentube Section installation arranged for submerged operation.



Interior of compressor room, taken during construction

power direct connected engine compressor units handling gas from the field to the absorbers. The booster units have 14 by 20-inch compressor cylinders. Two of the remaining four compressors have 24 by 20-inch compressor cylinders and the remainder 26 by 20-inch cylinders which are handling gas from a 10-inch vacuum at the intake scrubbers to a pressure of 30 pounds per square inch. Each unit handles approximately 1,700,000 cubic feet of gas a day under these operating conditions.

Economy in initial installation cost including savings in the amount of floor space required and in concrete footings as well as fuel savings over the usual two cycle engine are claimed for the new type engines. The single engine unit such as is used and the Gillespie and Moran plant occupies a space 6 by 23 feet requiring 35 cubic yards of concrete for footings. This compares with a floor space requirement of 12.75 by 23 feet for a 4 cycle twin unit of comparable power output which requires 46 cubic yards of concrete for foundations. A single acting 2 cycle, 180 horsepower engine requires a 10 by 20-foot floor space and 44 cubic yards of concrete.

One of the important features of the new engine is the fact that no piston rods run through hot combustion chambers requiring water cooling of rods and stuffing boxes. Power is transmitted to the crankshaft through two driving rods operating from a cross head between the two cylinders. The driving rods are carried entirely outside the hot cylinder, paralleling it on each side. Cylinders are of 16-inch bore and 20-inch stroke.

To obtain fuel efficiency on this type of engine the manufacturers have provided a method for complete scavenging with air followed by an injection of fuel gas under 15 pounds pressure with a consequent turbulence which mixes gas and air thoroughly before firing.

At the end of its forward stroke the piston uncovers an exhaust port and an inlet air port. The air entering the cylinder is under a pressure developed in the rather large space between the piston and the front cylinder head. The piston end is shaped to deflect the inrush of fresh air to the exhaust port purging the cylinder of inert gases of combustion.

When the returning cylinder has covered the exhaust ports the gas inlet valve at the upper part of the opposite end of the cylinder is opened admitting a quantity of gas controlled by the governor. The 15-pound pressure at which the gas is admitted is higher than the air pressure in the cylinder thus creating the mixing turbulence previously referred to. It is claimed that scavenging is so completely done that no burned gases remain in the cylinder to take up space which should be occupied by the firing charge.

The manufacturers report a fuel consumption of 10.4 cubic feet per indicated compressor horsepower hour. The 200-horsepower unit is reported as producing 91.0 indicated compressor horsepower at 200 revolutions per minute.

The plant was designed by Paul Schaefer who is in charge of gasoline plant operation for the Gillespie & Moran interests.

Will Demonstrate Method To Clean Tank Cars

NEW YORK — A demonstration which will be of interest to many refiners at the International Petroleum Exposition will be that showing how paint or dirt is removed from tank cars, which will be done by Oakite Products, Inc., of New York, sellers of industrial cleaning materials and methods.

Five coats of paint will be removed from a model tank car which will be equipped with removable tank surfaces to permit an entirely new stripping demonstration every few minutes.

An actual back shop cleaning tank will be in operation so that visitors may observe the actual cleaning of heavily coated valves and other equipment with Oakite cleaning materials.

Oil Electrical Equipment To Be Shown

PITTSBURGH, Pa.—Various types of gears applicable to oil fields and other equipment adapted for oil industry work will be shown by the Westinghouse Electric & Mfg. Co. at the International Petroleum Exposition. The Westinghouse-Nuttall plant will exhibit the gears.

Other apparatus to be displayed will be the Osiso, an electrical instrument for use in geophysical studies of possible oil and salt domes; 200 ampere portable motor generator arc welding equipment; a rig lighter turbine, floodlights; outdoor sub-station; and type HA and C heaters.

Nine sales engineers will represent the company at the Tulsa exhibit.

EACH user of the Gray Process has a definite problem to meet: his own crude, different cracking conditions, and—most important of all—Sales conditions in his own competitive market. The unanimity of satisfied licensees is ample evidence of the value of Vapor Phase Refining to them.

And in most cases the process requires so little attention that, aside from the large savings effected, the operators "don't know it's there"—a rare recommendation for refinery equipment.

Recent improvements have further increased yields per ton of clay. In some installations, polymerizers are running six months and more without recharging.

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Cut your refining costs.

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Economic Effect of Gas Lift on the Natural Gasoline Industry

By F. W. Lake* and C. C. Taylor**

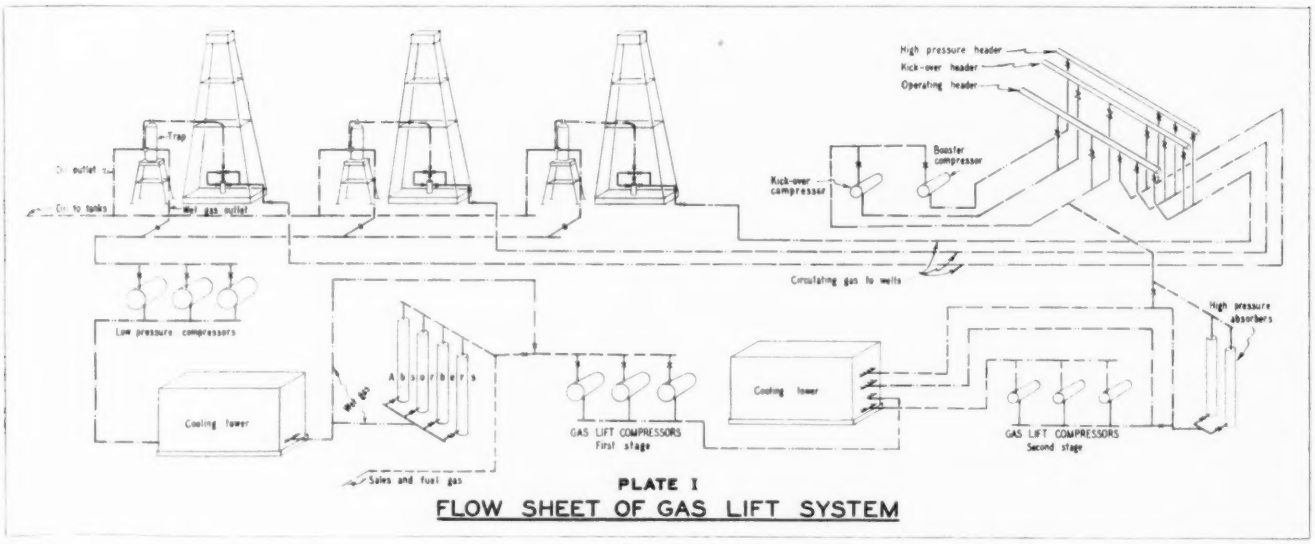


PLATE I
FLOW SHEET OF GAS LIFT SYSTEM

SEVERAL years ago, the advent of gas lift as one of the principal means of producing oil particularly in the early life of a field caused considerable speculation as to its economic effect on the natural gasoline industry.

Until recently, however, sufficient data could not be obtained to permit any comprehensive view. After three years of gas lift operation on a group of wells in the Richfield district, California, several pertinent facts have been brought out which apply in varying degrees to gas lift operations in any district.

As usually applied in most efficient systems, gas is compressed to the required pressure in a central compressor plant and pumped to a centrally located distributing header or manifold. If there are wells requiring widely divergent pressures, this should be considered in designing the compressor plant so that a certain volume at one pressure may be pumped to the distributing header while a different volume at a different pressure can be pumped to the distributing header separately.

From the distributing header individual lines are run to each well and by the application of meters and valves on each line, the required volume of gas can be continuously or intermittently delivered to each well on the system from the central plant.

The gas is usually introduced into the casing head between the casing and tubing and pumped down to the bottom of the tubing. It enters the tubing mixing with the oil and also being dissolved in the oil to a certain extent. Usually a few perforations are drilled in the tubing a few feet from the bottom to allow the gas to enter the tubing through a different opening than the oil.

The oil gas mixture rises in the tubing similarly to natural flowing conditions and enters the trap or separator. Here the oil and gas are separated, the oil flowing to the flow tanks and the gas entering the gathering system.

Through the gathering system, the gas is pulled from the various wells by the compressor plant and delivered to the absorption plant where the gasoline content is removed and the dry gas delivered to the gas lift compressor plant, the excess being sold or used as fuel on the lease.

Plate I is a flow sheet of the gas lift system showing the relation of the equipment used. The gas lift system is thus a closed circuit, the gas alternately compressed and expanded as it does the work of lifting the oil.

The circulated gas as it lifts the oil in the tubing comes in contact with it and removes a certain amount of the lighter constituents. This results in an appreciable increase in natural gasoline production.

There is considerable difference of opinion as to whether this gasoline if left in the oil would reach the refinery stills, or would evaporate from the oil in transmittal and storage, thus representing a true saving if extracted in the natural gasoline plant. Trap pressure, gravity of the oil, condition of the flow and storage tanks, distance from the refinery, number of times the oil is handled enroute, and the elapsed time between its production and its arrival in the refinery stills are factors which control the evaporation losses and which, under proper conditions, could be so regulated as to prevent any loss.

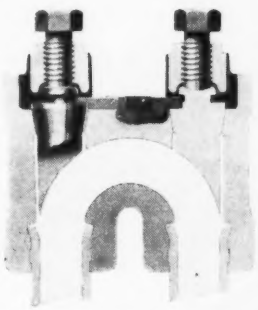
If all losses were eliminated, the increased natural gasoline production would not represent a true saving. However, under the majority of operating conditions, there is no question but that a large proportion of the apparent increased natural gasoline production is a net saving and represents a commodity which otherwise would be lost.

The stripping action of the gas on the oil is directly proportional to the volume of gas produced as is illustrated by the decreasing yield in gallons per 1000 cubic feet with increasing gas-oil ratio in thousands of cubic feet per barrel. With decreasing yields, however, the total gasoline production is increased, due to the larger volumes of gas produced. To fit the conditions for any particular case, the degree of stripping action can be regulated by the proportion of wet gas re-circulated or the pro-

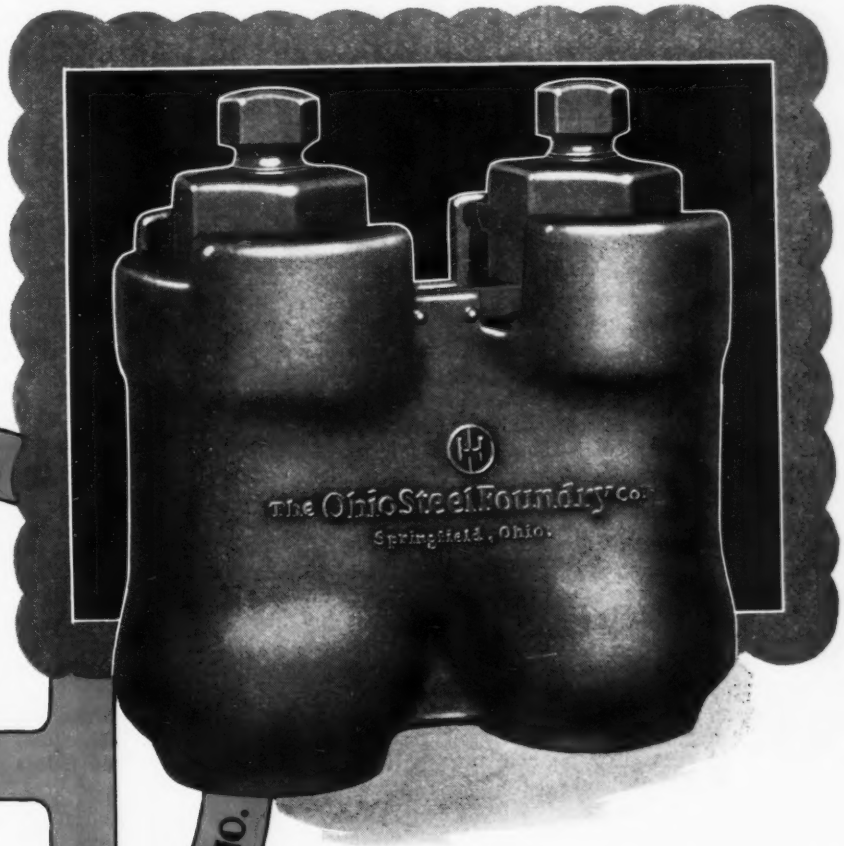
*Superintendent of Production, Orange Division, Union Oil Co. of California, Brea, Calif.

**Assistant Superintendent of Gas Operations, Southern Division, Union Oil Company of California, Santa Fe Springs, California.

frictionless RETURN BENDS



Notice this sectional view. Isn't "Frictionless" instantly suggested?



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It is the return bend of modern efficiency—"Frictionless".

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Plants in
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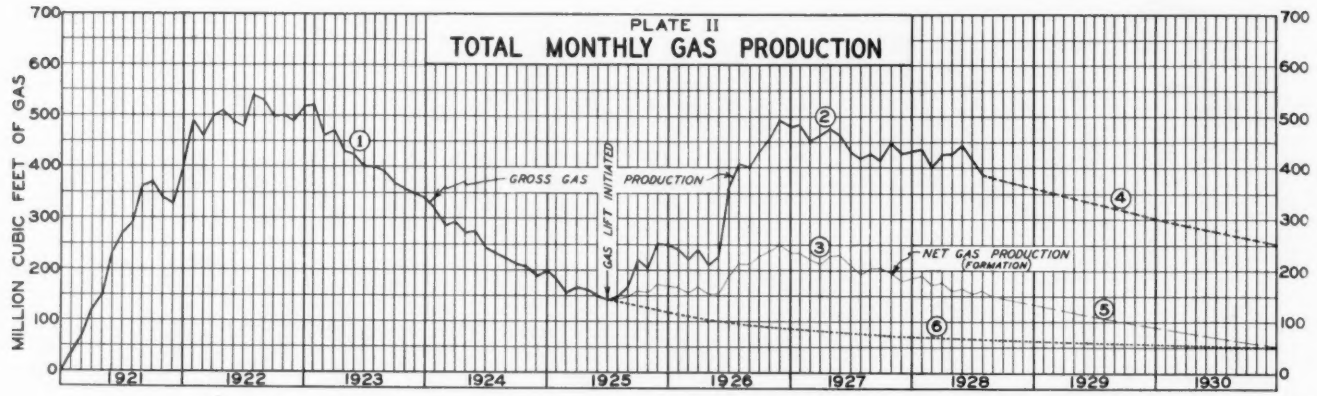


portion of the gasoline extracted in the absorption plant.

Obviously, this can be carried to a point where no gasoline whatsoever is extracted, with the exception of what is removed in the cooling and compression, and wet gas used in circulation.

Plates II and III give gas and gasoline production curves of the group of wells previously referred to. The influence of gas lift upon the gasoline production and the gross gas handled is evident. On Plate II, Curve 1-6 is the actual gross gas production up to June, 1925 when gas lift was initiated and the extension of this curve at its probable rate of decline. Curve 2 is the total gas production after gas lift had been initiated and Curve 4 is the probable rate of decline of Curve 2. Curve 3-5 gives the net gas production, that is, the gas being produced from the sand under the gas lift method of production and its probable rate of decline.

Plate III, Curve 1-3 gives the total gasoline production up to the start of gas lift operations and the probable rate of decline after that point. Curve 2-4 gives the actual gasoline production resulting from gas lift operations with its probable rate of decline.

From a study of these sets of curves, the importance of gas lift operations is evident. The two most important features that the curves bring out are (1) the rate of decline is slower under gas lift operations than previously and (2) the peak conditions under gas lift approximate closely the original peak conditions for the group of wells both in gas and gasoline production.

From Plate II, it is also evident that the net gas production under gas lift operations will approximately equal the gas production under pumping conditions, but will be produced in a much shorter length of time.

As previously pointed out, the increase in gasoline production is appreciable and represents, under average operating conditions, a net revenue which otherwise would not be obtained. Both gas and gasoline curves show characteristically rapid rises from the start of production to peak conditions and then a fairly rapid decline after a relatively short peak. It is also evident that if gas lift operations had been started as soon as the first decline began, conditions would have been different. Peak conditions would have been maintained for a considerable period of time and the decline would have been much less rapid.

In constructing an absorption plant to be used in treating the gas production from a group of wells which would be produced by other than gas lift methods, it is evident that to build a plant to handle peak conditions, it requires a considerable investment in equipment which would be used at full capacity only a short period in the life of the wells.

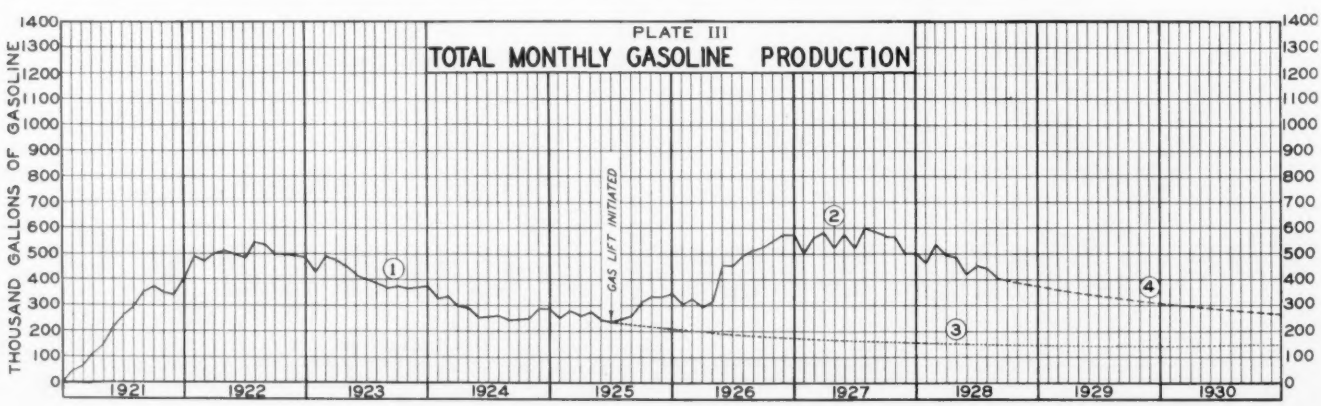
Therefore, it is usually the practice to build a plant to handle less than peak conditions, which results in a low extraction efficiency for a short period of time while peak conditions predominate, thus a portion of the natural gasoline production possible is lost during this interval.

Where gas lift will be used as a method of maintaining production after the flowing life of the wells cease, the absorption plant and attendant equipment can be constructed for peak conditions with a reasonably sure outlook that it will be run at full capacity for a much greater period of time and that the decline in the gas volumes to be treated will be much less rapid than is usual in connection with other methods of production.

The results of these conditions will of necessity be a large reduction in unit operating cost, the return of the investment in a shorter period of time with less interest charges, and a large increase in the net revenue obtained not only because of the above factors, but also because of the increased gasoline production.

It is likewise evident that absorption plants can be profitably constructed and operated under conditions where without gas lift, the short period of large production would not permit the return of the investment in the time interval necessary. The absorption plant must be paid for within the first year or two of operation as the decline in production in the latter life of the wells merely permits operating costs and small profits to be made.

The advent of gas lift as a method of oil production has had a pronounced economic effect on the natural gasoline industry. Assuring as it does, a more uniform and continuous source of supply, unit costs are reduced and the total production is increased.



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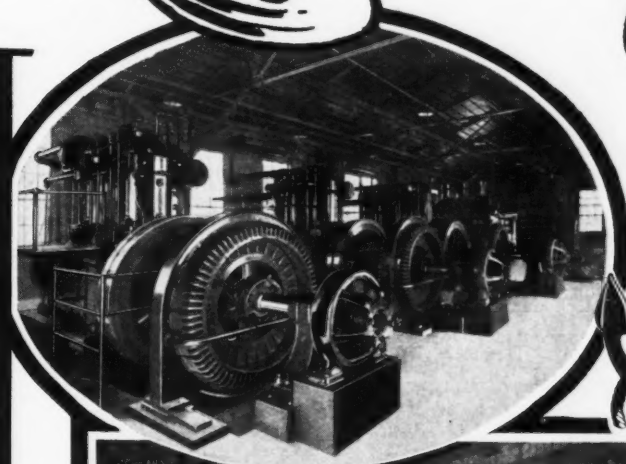

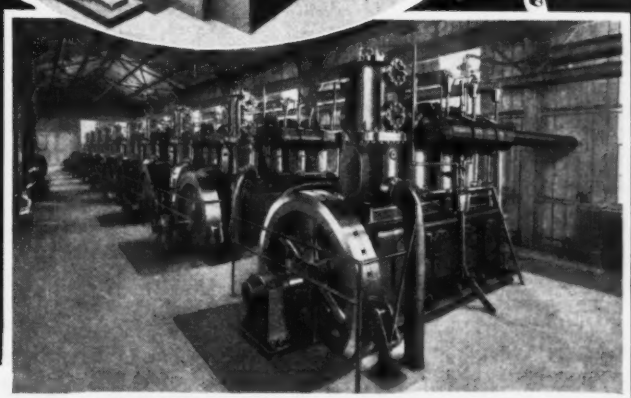

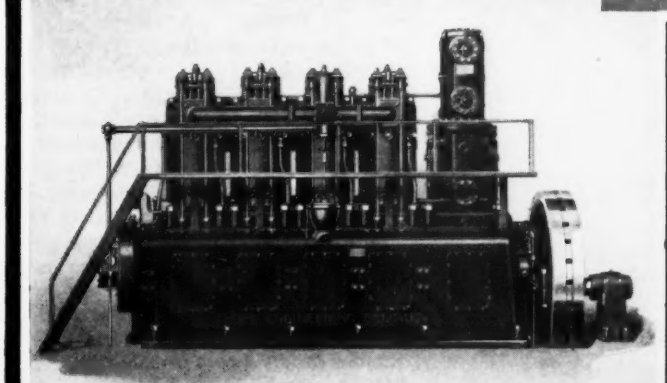

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The Trend of Gasoline Plant Design

By Paul Barton*

IN A discussion of the trend of design of natural gasoline plants it is necessary to review the economic changes which have been taking place in the industry within the past few years. The industry itself is barely 20 years old and the last five have seen a very marked change in it. In fact in this short period the industry has grown from but little more than a by-product industry to one of major proportions.

When the term "Absorption Plant" is used today those familiar with the industry immediately picture a plant operating on what may be called the standard absorption circuit. Such a plant would consist of a battery of single stage compressors operating as an auxiliary unit for the purpose of gathering field gas being produced at a variety of relatively low pressures, and boosting the composite intake gas to a uniform discharge pressure, usually 30 pounds. The 30-pound gas is then cooled and conducted to the gas absorbers where it is contacted counter-currently in a single pass bubble tower with cold lean absorption oil.

The rich oil from the bottom of the absorbers is pumped through heat exchangers counter-current to the hot stripped oil from the still, thence through preheaters where it is raised to the maximum temperature of the circuit. The preheated oil is discharged into a vertical evaporator still which is again a conventional bubble tower where the hot oil may be effectively contacted counter-current to steam injected into the bottom of the tower.

The hot oil from the bottom of the still passes through heat exchangers as already indicated after which it is pumped through oil coolers where it is cooled to the minimum temperatures obtainable with water and atmospheric cooling towers before being conducted to the top of the absorbers. The hot vapors and steam from the top of the evaporator are partially cooled in a rectifying or dephlegmating unit for the purpose of controlling the end distillation temperature of the gasoline. The gasoline vapors pass through condensers at still pressure and are cooled to the lowest temperature obtainable with water from atmospheric cooling towers.

Natural gasoline as produced in the operation of such a circuit may or may not be of a specific grade but its characteristics may be varied within certain limits by varying the oil-gas ratio in the absorbers, by varying the still and condenser pressure and by the use of recompressors or re-absorbers on the condenser vent vapors. If it is necessary to meet stringent recovery and gravity specifications it may be impossible to operate such a standard circuit efficiently to obtain the specified product, in which case it has been customary to operate the plant for efficient extraction in the absorbers and to submit the final products to a subsequent weathering cycle or rectification.

Factors Which Have Influenced Past Development

From the beginning of the industry through most of the development period natural gasoline (or casing head gasoline as it was originally called) was a nondescript product consisting of the liquefiable constituents of natural gas in whatever proportions they happened to be recovered in the particular system in use.

For a long time the gross production of the industry was relatively small. Under such a condition the exact nature of the product was relatively unimportant. The price was comparatively high, making the business profitable in spite of unscientific operation and crude equipment. Year after year, however, the gross production mounted and with the larger quantities in use the purchasers began to realize that the marketability of their motor fuels was decidedly affected by lack of uniformity of the product.

Consequently they began to define certain characteristics. This resulted in attempts to balance the boiling range, gravity and volatility of the finished product. At the same time a declining price forced producers to either improve their equipment and operation or discontinue production.

The result of these influences has been the introduction of sound scientific principles. It is rapidly being realized throughout the industry that most of the so-called specifications for natural gasoline which have been based on empirical tests are not scientific specifications but merely arbitrary correlations of certain physical and chemical properties of the individual hydrocarbons of which the gasoline is composed.

However, the operating conditions of every unit which ultimately affects phase-equilibria, such as oil coolers and preheaters, should be subjected to very close check and those units involving phase-equilibria should be checked by analysis and their performances correlated.

The boiling-range and volatility of natural gasoline are extremely difficult to define in terms of empirical tests such as have been available in the past. The reason for this is that these properties are controlled entirely by the characteristic boiling-points and vapor-pressures of the individual hydro-carbons of which the gasoline is composed and further by their partial-pressures which in turn depend upon the proportions of the various hydrocarbons present.

The unsatisfactory part of the use of empirical tests for the definition of these properties is that the results indicate only the composite effect without reference to individual characteristics of the components.

Recent Development of Fundamental Analysis

The inadequacy of empirical tests for the definition of the characteristics of natural gasoline has been felt by natural gasoline engineers for several years. There has been an even greater lack of dependable testing procedures for controlling plant operation. At the present time, however, the technical minds of the industry are beginning to think in terms of fundamental analysis. By fundamental analysis we mean the separation of the hydrocarbon mixture into fractions composed essentially of the pure constituents in the proportions in which they occur in the mixture, in other words, the percentage composition of the mixture in terms of the hydrocarbon components.

It so happens that the hydrocarbons which are responsible for the greatest variation in the properties of natural gasoline are the group in the paraffin series from methane to pentane inclusive. Therefore, for purposes of analysis the fractionation is usually stopped at pentane thus greatly simplifying the analytical procedure.

New Product Characteristics as Revealed by Analysis

The use of analysis is still too limited to be of much value in defining the specifications of natural gasoline. However, there is little doubt that the really important properties will be revealed by studying the composition of natural gasoline. For instance, if it is shown that the presence of a single constituent in relatively small proportions may be largely responsible for high vapor pressures and high distillation loss, a simple specification eliminating that member would be of much more value than a combination of several empirical tests which accomplishes the

*Barton, Manning & Warner, Consultants in Gasoline Plant Design for Jackson Engineering & Equipment Co.

result only by penalizing other constituents which are valuable.

Plant Efficiency Takes on New Meaning

Elaborating somewhat on the idea just expressed, that is, that a certain hydrocarbon component may be considered undesirable in the finished gasoline, we arrive at the first concrete conception of gasoline plant efficiency. The hydrocarbons in question occur in natural gas in a consecutive series with increasing boiling points.

As soon as we decide the division point between the desirable and the undesirable as in relation to their effects upon the properties of the finished gasoline, it follows that a perfect plant would have to recover all of the desirable constituents and completely eliminate the undesirable ones. Such an efficiency standard is unatainable as the extraction efficiency is definitely limited by the equilibrium between the vapor and liquid.

Equilibrium simply means that for any given composition of vapor or gas there is a corresponding composition of liquid, and that these compositions of vapor and liquid will remain constant regardless of time of contact. This equilibrium composition is shifted by changes of temperature and pressure, or it may be shifted by changing the composition of either the vapor or liquid by dilution with another menstruum.

The economic balance between cost of additional temperature, pressure, oil circulation and steam consumption and the value of the additional hydrocarbons recovered determines the equilibrium compositions. The operating conditions to secure this performance must then be correlated to attain the end. The logical definition of plant efficiency would be the per cent approach to the equilibrium limit.

The consideration of efficiency from this standpoint gives the natural gasoline engineer a definite objective, since the efficiency of each individual unit in the plant may then be considered separately or in its relationship to the plant as a whole.

Plant Units and Their Correlation

Every separate unit in a plant must have some definite function to perform in order to have a reason for existence. For the purpose of this discussion we may neglect those units which affect only the mechanical or thermal efficiency of the plant, such as pumps and exchangers.

The correlation of analytical results is absolutely necessary to intelligent plant operation as well as design. For example, a steam still might be capable of attaining equilibrium under certain conditions, but if those conditions are not suitably correlated with the desired equilibrium at another point in the plant, such as, the top plates of the absorbers, the absorption efficiency would be adversely affected.

Vital Points in the Absorption Circuit

Assuming that all other operating conditions are favorable and the various other units are designed to perform their proper functions, the most vital point in the absorption circuit is the still.

While the nominal function of the still is to remove absorbed gasoline from the oil, its real function from the standpoint of design and correlation of operating units is to prepare the absorption medium to take advantage of the favorable conditions in the rest of the circuit. The second most vital point in the absorption circuit is the bottom plate of the absorber, for this is the point at which the oil has its maximum effective load of absorbed constituents.

In other words, if there are more desirable constituents available for absorption than the oil is able to retain at the temperature and pressure conditions existing at the bottom of the absorber, the extraction efficiency will not be its maximum regardless of the absorber efficiency. The third most vital point in the absorption circuit is the top plate of the absorber, for this is the point at which the concentration of desirable constituents in the gas has reached its minimum figure.

Some might consider this the most vital point since this is the place at which the loss of valuable contituents occurs. However, the equilibrium obtainable at this point with respect to the pentane and heavier fractions is directly dependent upon the performance of the still and the temperature of the lean oil so that its control is in reality at other points in the circuit. Since the butane content of lean oil is practically zero, the extraction efficiencies of this and more volatile constituents, are controlled by conditions below the top plates, where conditions are less favorable for absorption.

Fred'k H. Bartlett, recently elected a director of the Sinclair Consolidated Oil Corp. of New York. Mr. Bartlett lives in Chicago and heads the largest real estate organization in that city.

It will be noted that the three most vital points given above are final equilibrium points. Before the advent of fundamental analysis into the natural gasoline industry it was practically impossible to study the actual effect of design, temperature, pressure and the characteristics of the absorption medium upon the equilibrium relationships since the gas absorption medium and gasoline had to be considered as composites. A great advance may be expected in plant design in the very near future when natural gasoline engineers begin to study cause and effect at these vital points in the absorption system by the use of this new tool—fundamental analysis.

We can not expect advancement to take place in the direction of greatly increased recovery of natural gasoline because the industry has already gone far in that direction, but we may expect important developments in the efficiency of handling the raw materials of natural gasoline manufacture.

Design Trend is Definitely Toward a New "Ideal" Plant

The trend of natural gasoline plant design is already toward a new ideal plant. The raw material to such a plant will not be considered in terms of gallons of gasoline per 1000 cubic feet of gas, but in terms of pounds of propane, butanes, pentanes, etc., available for the manufacturing process.

The plant will be designed to work up the raw material in one throughput separating the raw material into desirable and undesirable groups, discharging essentially fixed gases as residue, separating intermediate fractions first to essentially binary mixtures for efficient rectification, rectifying these mixtures, and diverting the various streams at the will of the operator to final or intermediate products as desired. In other words, the ideal natural gasoline plant will have an operating plan very similar to the most modern refinery units with the exception that the fractions or cuts from a natural gasoline plant will be much nearer pure compounds than is possible with the higher-boiling materials of the refinery.

Judge Morris in his opinion handed down in the Federal court, Wilmington, Del., as published in the NATIONAL PETROLEUM NEWS of May 16, 1928, stated that the use of rectification in the natural gasoline industry was a normal development and came about as soon as economic conditions in the industry warranted.

Use of Controls as Aid to Rectification In Natural Gasoline Plant

By Emby Kaye* and A. I. Sellers**

IN 1923 the "stabilizer" was presented to the natural gasoline industry. Several low pressure columns were built that year. It was 1926 that saw the beginning of present day high pressure fractionating columns. In the short space of two years an art was developed from an uncertain questionable device to a highly scientific rectifying apparatus controlled almost entirely mechanically, the purpose of which is to rectify a mixture of hydrocarbon liquids into their several component parts.

In a practical way the high pressure rectifying column is used to "stabilize" natural gasoline and to remove, as desired, certain constituents, like propane and butane and possibly other fractions that may be desired for specialized industries, rubber solvents, gas machine, gasoline, etc.

At this stage of development 95 per cent of rectification is confined to freeing natural gasoline of ethane, propane and as much of butane as is not desired to be retained in the finished product. Owing to a limited market for natural gasoline by-products and special aviation fuels, only few plants have been equipped for complete rectification to separate any great number of the components.

A few plants now are actually on a manufacturing basis and provide the existing market with "hydrocarbon fuels," aviation gasoline, rubber solvents, gas machine gasoline, gas enricher gasoline, and such quantities of other components as may be required by scientific institutions for research work. For this work multiple columns have been used according to the number of products that are desired.

In this discussion two columns are used and this represents the average installation of this type. The process, while continuous and automatic once set in motion and while it follows conventional design, nevertheless has many important control problems which are to be discussed briefly. In fact rectification, as described, is so highly standardized that the development of the art henceforth will probably be in matters of control which is of paramount importance, rather than design.

Flow of Gasoline and Vapor

All gasoline made by distillation is pumped from the run tank to the surge tank, and all gasoline made by compression or by recompressing uncondensed still vapors is trapped direct from the accumulators to the surge tank and blended with the more stable product from the run tank. A pressure of from 75 to 100 pounds is maintained on the surge tank to prevent evaporation of the lighter hydrocarbons and to prevent gassing of pumps which take gasoline from this tank.

EMBY KAYE

The transfer pumps take the gasoline from the surge tank and discharge it through the preheater, where the temperature of the gasoline is increased from 60 to 80 degrees F. as required, depending upon the temperature of the other products leaving the tower, and counter-flowing the incoming product, also on the percentage of stable gasoline left to counter-flow the raw outcoming gasoline.

In a hypothetical plant a grade AA gasoline is finished in the base of No. 1 tower and represents 50 per cent of the untreated gasoline delivered to the No. 1 tower. The temperature of the raw gasoline leaving the heat exchanger ranges from 100 to 109 degrees F. After leaving the heat exchanger, where the temperature has been raised from 80 to about 180 degrees F., the gasoline passes into No. 1 fractionating tower about 15 feet above the base and passes through six trays on its way to the base of the tower and reboiler, where the temperature is stepped up to 275 degrees F. and where all undesirable vapors are driven from the AA product.

Heating in the base of the tower alone does not free the raw material of all undesirable vapors. This is partly accomplished by the hot vapors leaving the base of the tower and passing upward through the bubble trays filled with the partly heated incoming gasoline.

Leaving the vapors, which have been freed from the stable gasoline at a point in the fractionating tower where the raw gasoline enters the tower, we now follow the finished AA product from the tower base through the outlet line to the heat exchanger, where part of the heat is transferred to the incoming gasoline. From the heat exchanger it passes through the level control valve, which is operated by a float on the base of No. 1 tower, and thence to storage. The gasoline leaving the cooler has been brought back to its original temperature of 70 to 80 degrees F. or as low as possible.

Again taking up the vapor circuit, the vapors pass up through the remaining 15 fractionating trays filled with down coming reflux and into the water cooled reflux condenser that is maintained at a given temperature and which will condense all hydrocarbons heavier than free butane under a given pressure. The reflux temperature in this case being 110 degrees and the given pressure 230 pounds. The uncondensed vapor, which is butane, and lighter vapors are passed from this condenser to the second fractionating column and enter at the same point as the raw gasoline entered the No. 1 column, but in the vapor stage rather than the liquid stage as on No. 1 column. The liquid, or butane, which reaches the base of the No. 2 column is that which has been condensed and fractionated out of the vapors passing up through the column. All lighter vapors are freed from the butane in the base of No. 2 column by applying and maintaining a given tem-

*General superintendent natural gasoline department, Skelly Oil Co.

**Superintendent of operations, gasoline department, Skelly Oil Co.

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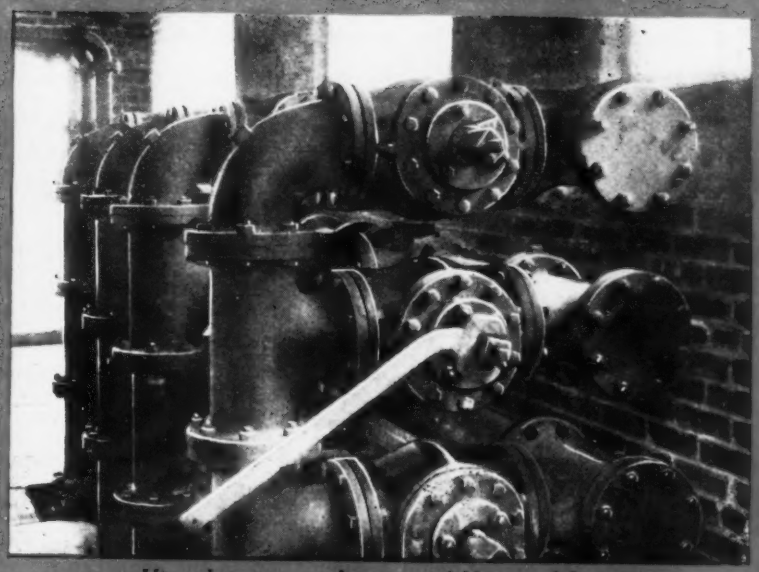
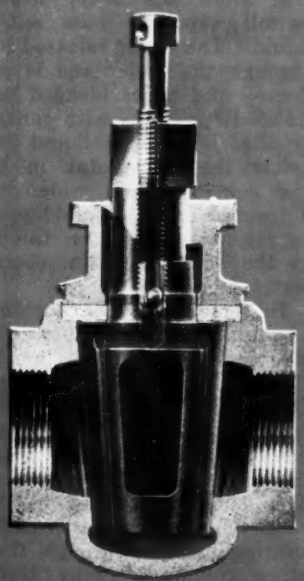


View shows a pump house manifold in an Arkansas Refinery equipped with Nordstrom Valves.



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Necessary Equipment for Stabilizing Natural Gasoline In a Two-Column Rectification Plant

NO. 1 TOWER IS EQUIPPED WITH THE FOLLOWING EQUIPMENT

1. Surge tank, where all gasoline is accumulated for delivery to No. 1 column.
2. Steam driven pumps for delivering the gasoline from the surge tank to the No. 1 tower. Pumps are equipped with governors to insure a uniform flow of gasoline going to No. 1 column.
3. Heat exchanger for heating the gasoline going to the fractionator and for cooling the stabilized gasoline coming from the No. 1 tower.
4. Steam heated and thermostatically controlled reboiler for heating and maintaining a constant temperature in the base of No. 1 tower.
5. Liquid level control for maintaining a constant liquid level in the base of No. 1 tower.
6. Final gasoline cooler for cooling stabilized gasoline leaving base No. 1 tower.
7. Water cooled and thermostatically controlled condenser mounted on top of No. 1 fractionating column.

NO. 2 FRACTIONATING COLUMN IS EQUIPPED WITH THE FOLLOWING

1. A thermostatically controlled, steam heated reboiler for heating and maintaining a constant temperature in the base of No. 2 column.
2. Water cooled reflux condensers for condensing liquid used in refluxing No. 2 column.
3. Reflux accumulator.
4. Steam driven pumps for delivering reflux from reflux tank to top of No. 2 column.
5. Flow controller for proportioning amount of liquid necessary for refluxing No. 2 tower.
6. Liquid level control on reboiler for maintaining a constant liquid level in the base of No. 2 tower.
7. Evaporator tank for receiving excess propane and ethane accumulations from the reflux accumulator.
8. Liquid level control on reflux accumulator for relieving or trapping the excess liquid accumulation to the evaporator.

perature on the butane in the steam-heated and thermostatically-controlled reboiler, the temperature being sufficiently high to vaporize all hydrocarbons lighter than butane under a pressure of 220 pounds and at a temperature of 190 degrees F. in this case in hand.

Heat exchangers not being necessary on the No. 2 tower due to the product entering the tower in the vapor stage, only a gasoline cooler and liquid level control are required to finish the butane product leaving the base of No. 2 tower. The vapor leaving the top of No. 2 fractionator is passed through the water-cooled reflux condensers and to the reflux accumulator. The condensers are maintained at a temperature which must be sufficiently low to condense propane under the given pressure.

A portion of the condensate from this tank is pumped back over the top of No. 2 tower to reflux the vapors passing up through the tower, the amount of reflux necessary being possibly eight times the amount of the product being processed through the tower, the correct amount being determined by weathering samples of condensation from the reflux condensers to determine if enough reflux is being recycled to separate all butane from the vapor leaving the top of the fractionator, or by subjecting the products to analysis in the laboratory.

Once the rate of recycling is determined, the flow controller which controls the pump delivery is set at this point and the product remains constant as long as all pressures, temperatures and processing rates remain constant. The excess amount of reflux accumulation is released continuously from the No. 2 tower reflux accumulator and passed to a weathering tank, the liquid held under 200 pounds pressure and a temperature sufficiently high to evaporate all ethane or lighter hydrocarbons, if any.

With the above-mentioned equipment, AA Grade gasoline is made, a butane cut is made with 4 degree distillation range as well as a propane cut with a 4 degree distillation range. The pressure maintained on the system is controlled by a pilot-operated back pressure regulator operating on the uncondensed vapors leaving the reflux accumulator tank. The pressure drop through the entire vapor circuit is only ten pounds.

1. Failure of pump governors to control speed of pump delivering gasoline to the No. 1 tower or pump packing leaking, which reduces pump deliveries. Any sudden change in the processing rate necessitates an adjustment in the required amount of reflux to be circulated over No. 2 tower.

2. Sudden weather changes which widely vary the percentage of butane, propane and ethane in the raw product processed, which also necessitates sudden changes in reflux circulation.

The above complications probably can be gotten away from, or partly remedied, by working out a volume control on the vapor going in No. 2 tower and installed to make adjustments on the flow control.

3. Failures of thermostatic controls to hold temperature constant results in driving heavy vapors through the tower on temperature increases, or failure to free the finished product of the lighter vapors if temperatures vary downward.

4. Failure of thermostatic control to hold temperatures constant on the No. 1 tower reflux, which results in passing pentane to the No. 2 tower on temperature increases. On decreased temperatures, the No. 1 tower is flooded with excess reflux which results in excess pressure drop and taxes reboiler capacity on No. 1 tower.

5. Fluctuating pressures on the system are caused by back pressure regulator not operating properly. Decreased pressure increases reboiling in the kettles and carries over heavy vapors from one tower to the other. Increased pressure decreases reboiling, leaving undesirable fractions in the finished product.

6. Leaky liquid level control valves will allow the tower to drain and permit vapor to pass out with the liquid. The vapor released here passes through the cooler and is partly condensed and hence blended back in the finished product with unsatisfactory results. When the liquid level drops below the thermostat in the kettle, the control opens wide due to the difference in vapor and liquid temperature and reboiling on the low liquid in the bottom of the reboiler is violently increased.

In some of the earlier installations of pressure fractionating columns, outside reboilers were designed to function upon the thermosyphon system. Considerable difficulties were encountered with the thermosyphon reboiler, due to intermittent surging of the liquid gasoline within the reboiler. This surging resulted in the loss of base temperatures and caused vapor surging upward through the fractionating column, thereby throwing the column out of equilibrium and thus destroying the efficiency of exhausting and fractionating.

To date we have been unable to locate any level controlling device that will accurately handle propane or butane under 250 pounds pressure, and all containers carrying these products must be very closely watched to insure constant liquid levels.

Production Engineering Section

THE issue of conservation of petroleum, raised by the United States government, has added its weight to the natural desire of oil producing companies to show a better profit on their investments.

¶ Production engineers during the past two or three years have turned their attention toward the promotion of conservation along many lines.

¶ Deeper drilling to find new sands, better equipment and better methods of using it, saving oil by better handling of storage on leases, increasing oil recovery from the sand by returning gas to restore the pressure, use of the seismograph and other instruments to determine more accurately the location of possible oil-bearing formation, and many other devices and methods have been and are now subjects of study by engineers.

¶ We thank those engineers who have contributed articles to this issue on various phases of production engineering and we believe the readers will thank them too.

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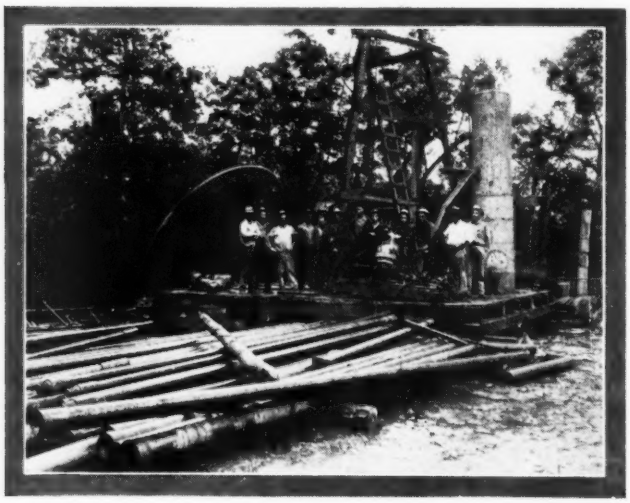

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Cockrell-McIlroy lease in Panhandle field of Texas showing 35,000 barrels of storage

Oil Conservation Demands More Care In Lease Storage Practice

By L. G. E. Bignell*

IT WAS in the fall of the year 1920 that petroleum engineers for the United States Bureau of Mines started work upon field tests to determine the possible saving to be expected by handling pretroleum on the lease in tanks sealed from the atmosphere.

The result of these tests along with other valuable data has been published in Bulletin No. 200 and Technical Paper No. 319 and has been accepted by the petroleum industry as basically correct and oil is now bought and sold at prices scaled according to the gravity of the liquid.

This change in method of purchasing petroleum was established in 1922 and immediately gave added impetus to the movement to make lease tankage tight to stop evaporation losses, increase the gravity of the oil and get the higher prices for it.

There were many instances where the use of tight tanks increased the gravity three or four degrees and added materially to the returns from the lease, and in some cases little refinements in the equipment have raised the gravity of the oil an additional .2 or .3 degrees and put it into the next higher price scale.

At the outset this opportunity to secure a higher price for oil of better grade led to a lot of speculation on the part of the producers to find means of blending oils in such a way as to produce a mixture of higher average gravity than that normally produced.

It was soon found, however, that this was not practical on the lease for there were too many factors entering into the blending process and the theoretical gains to be secured did not justify the additional cost necessary to get them.

It therefore soon resolved itself into a matter of following simple production practices and equipping the tanks with relief valves for excess pressures or vacuums and educating the lease men to handle them properly.

This problem of field storage and accessories has had the best thought of many manufacturers and field men alike and numerous devices have been placed on the market for these purposes, and there still seems much room for improvement.

Primarily a pressure relief valve to operate in a satisfactory manner at any predetermined pressure must have incorporated in its design three fundamental principles:

1—Positive release of pressure at the predetermined limit;

2—Character of orifice that will permit free escape of gas;

3—Simplicity of operation and parts.

For the usual type lease bolted tank the pressure valves have been of the dead weight type, either operating upon some central or peripheral form of guide, or so hinged that they can be lifted from the seat and will fall back into place when the pressure is released.

Most valves have been provided with some form of hood or cover and set on the tank deck or on the manhole dome cover plate and there is some room for improvement in these details also.

A study of the first requirement will develop the fact that the type of seat for the valve weight and the metal used for the guide stem has a very decided effect upon the tendency of the weight to "freeze" to its seat.

As an example it has been found that a cast iron weight upon a brass seat will sometimes become inoperative because of sulfur gases in the tank that will rapidly corrode the brass and with some moisture will cause the iron weight to be held to the seat so that an appreciable increase in the release pressure is noted.

Again, in climates where the temperature falls below freezing during part of the year this metal to metal seat has been found actually to accumulate a coating of frost or ice that is effective in holding the valve closed until the tank is damaged by internal pressures.

This is due to the fact that gas escaping through a very thin orifice, even at moderately low temperatures, say around 40 degrees Fahrenheit will have a refrigerating effect and take heat from the metal over which it passes as it expands and so chill it that frost is formed by precipitation of the moisture from the atmosphere or out of the vapors within the tank that come in direct contact with this chilled metal.

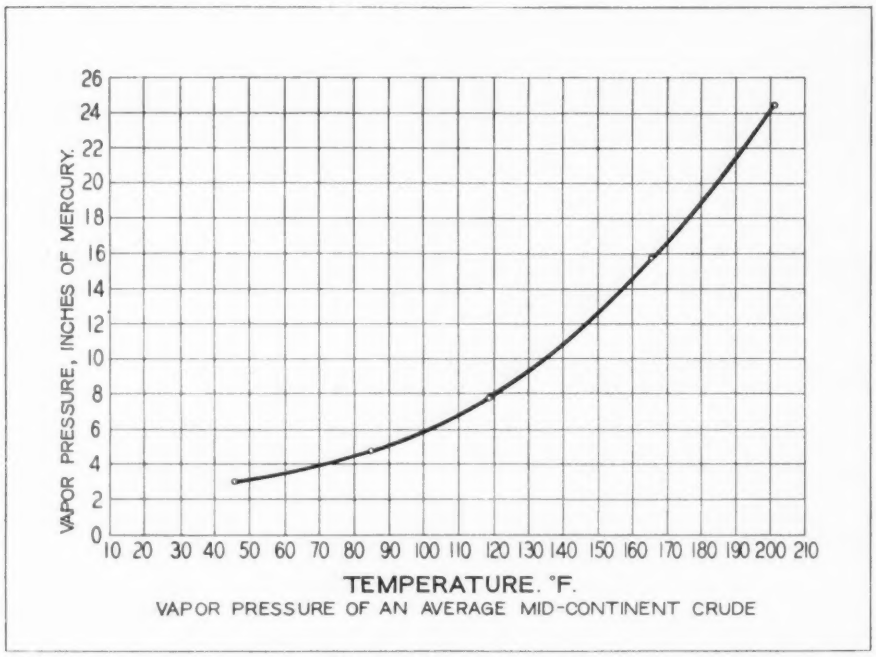
In any dead weight valve there is a tendency for the valve weight to "float" at partial pressures and lift

*Research engineer of Parkersburg Rig & Reel Co., and associate member of American Institute of Mining and Metallurgical Engineers.

slightly from the seat so that a test with soapy water will show bubbles at the orifice so formed, even with a valve that has a ground seat and has been checked as tight when the weight has been held in place by external pressure during the test for fit of weight to seat.

It is therefore almost impossible to eliminate this inherent defect in this type of valve and as it is important that apparatus of this kind be suitable for use in any field and with any character of oil and gas it seems necessary to develop other types of pressure valves for this purpose.

Liquid seal valves have been introduced and tried out in many fields but there seems to be a great deal of difficulty in getting the lease men to keep the liquid in the seal.



Vapor Pressure of an Average Mid-Continent Crude. (After Wiggins, Bureau of Mines Technical Paper 319)

The nature of such valves makes it necessary to pass vapor or gas at relative high velocity through the liquid used for the seal and this atomizes it and it is carried out with the escaping gas to the atmosphere.

The usual sealing liquid used is kerosene, mineral seal and crude petroleum and in some valves they recommend mercury or quicksilver.

While mineral seal is not readily volatilized it can be vaporized, that is broken up into a mist, without much trouble especially when high velocity gas is passed through it and the other petroleum liquors are not hard to volatilize so these materials seem unsuited for this purpose.

Mercury has some advantages not possessed by the other liquids but is not a common element to be found around the lease and being a novelty is sometimes wasted, and if lost from the seal in any way is not usually on hand in warehouse for replacements. This of course, can be overcome by preparedness, and a supply carried in the lease warehouses.

There is, however, a much more logical means of overcoming the inherent difficulties in liquid seal design in which gas passes through the liquid when the tank is discharging and that is to by-pass the gas or the liquid so that the tank is relieved of its seal temporarily only, and after the valve has functioned the liquid again flows back into its receptacle and the tank is again sealed against the atmosphere.

Such valves have been designed and in service gave good results, their only limitation being the low pressure at which they must operate.

Because of the fact that the seal is only equal to the liquid column set up in the valve over the gas zone in the tank, the pressure built up within the tank is very low.

Water gives a pressure at sea level equal to 0.43302 lb. per square inch for each foot of height, or a column of water one inch high equals 0.5774 ounces. Therefore to seal a tank for one pound pressure, as required in some instances, would require a liquid seal valve that had a column of liquid in it equal to 2.3094 feet of water at 62 degrees Fahrenheit temperature.

This would be a rather cumbersome piece of equipment and to give any appreciable volume for the escaping gas, which would be a requirement if 16 ounce pressure gas is to be released quickly, would be so large that it would be rather unsuited for the usual type of bolted or welded field storage tank.

A column of mercury with its higher specific gravity would be much better suited to this condition, but considering the area required in the valve to permit of quick escape of the gas other problems in design are presented that are not easy to overcome in models that are compact and suitable for small tanks.

Another consideration that must be given to valve design is the shape of the orifice through which the vapor will pass in entering, in passing through and escaping from the valve, for change in size and shape of these openings will have corresponding effects upon velocity of the gas and result in back pressures within the tank.

Tests have been conducted showing these details in design to be very important, for valves releasing at normal pressures of 2 ounces above atmosphere and passing 200 cubic feet per hour of gas through the orifice formed by the valve and seat have built up a pressure of 5 ounces when called up to handle 2,200 cubic feet of gas per hour.

This feature in shape of orifice is so essential to the good operation of valves on lease storage and pipe line tanks that to overlook designing the orifices properly will sometimes cause pressures to be put on the tank that strain the metal beyond its elastic limits and failure follows.

If the opening through which the gas or vapor must pass in coming into or passing out of the valve, is also restricted it has the same effect in building up pressure within the tank and these items must also be given careful consideration in mounting the valves on the tanks.

Logically the proper place for the mounting of the pressure relief valve is at the highest point on the tank deck, and this is also true of the vacuum relief valve, and on the bolted type lease storage tanks this is on the manhole dome cover.

There is an objection to this place for mounting the valves in that it will require the operatives to walk over the tank deck to reach them, or the building of additional runways from the tank edge to its center, increasing the cost of the tank battery.

Modern field practice is tending toward the use of runways built alongside the tanks in some convenient position that will enable the gaugers and lease men to thief and gauge the tanks without going on the tank decks. This is very desirable for even a moderate amount of walking over the bolted tank deck will open seams and make it no longer tight.

With the walkways along the side of the tank it is desirable to have all relief valves so placed that they can be easily examined without passing over the tank deck. This can be done by the use of "hillside" flanges or pads on the deck to equal the pitch in the deck and present a surface that is level upon which the valve can be mounted.

One of the most important considerations that should be given to all valves is to have them designed for the safe working pressure of the tank upon which they are to be used.

The larger the tank the lower the safe working pressure for with the increase in the deck diameter the total pressure acting on the bolts at

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the periphery of the tank is increased as the square of the diameter.

The thickness of the metal used in the tank deck is usually the same for small and large bolted tanks, that is about 12 gauge for modern storage of the bolted type, and the bolts in the periphery are also of the same diameter with the same centers in the bolt circle.

Therefore if a tank 10 feet in diameter is set for a working pressure of 3 ounces per square inch, the total pressure within the tank will be about 2120 pounds and deducting for the weight of the roof will give a net effective upward thrust of about 1770 pounds.

A tank 30 feet in diameter with valve regulated for the same 3 ounce pressure would develop a total pressure of 19,085 pounds and deducting for deadweight of deck would leave a net of 15,944 pounds.

It is true that the pressure per square inch in each case is the same and the tensile strength of the steel is far above the working pressure of the tank, but the shear on the bolts is increased and while there are more bolts in the 30 foot circle by 376 than there are in the 10 foot circle, the total pressure in the larger tank is 13,824 pounds greater than in the small one. Another way of expressing it is that in the small tank each bolt in the periphery of the tank resists a total pressure of 9.4 pounds while in the large tank each bolt must resist a total pressure of 29.2 pounds.

It is therefore very desirable to equip the larger tanks with valves of lower working pressures, and inasmuch as any pressure above atmosphere that is placed over the surface of the oil within the tank and maintained there is effective in stopping evaporation there is no logical reason for placing high pressure valves on any tank.

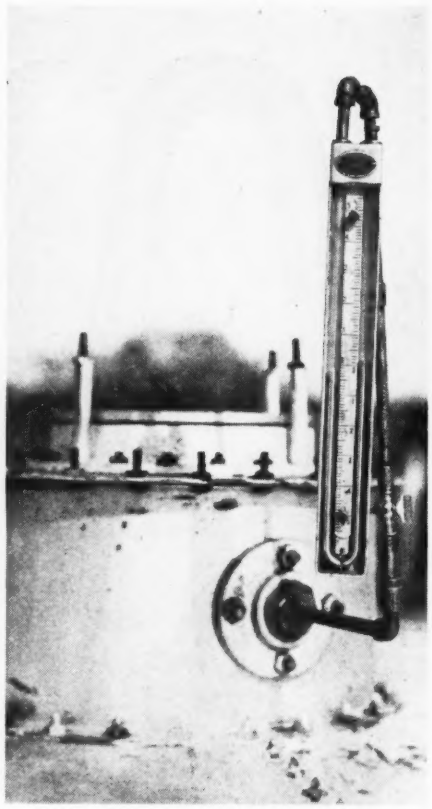
The theory advanced that tanks should be sealed at something approximating the vapor pressure of the liquid within the tank while good is not practical.

The vapor pressure of petroleum in its crude state is constantly changing according to the temperatures and pressures within the mass and to even determine what this vapor pressure should be for any given oil under any given condition is a problem in itself.

Wiggins in Technical Paper No. 319 states on this subject:—"The absolute pressure of this (oil secured at Sugar Creek) crude at 90 deg. F. appears to be about 5 inches of mercury."

(See graph Vapor pressure of an average Mid-Continent crude.)

In Bulletin 200 Wiggins also says:—"The vapor pressure of a liquid is the pressure that the vapor from the liquid will set up in a vacuum before evaporation ceases, or it is the partial pressure that the same liquid would set up in a closed vessel containing air. For the same liquid this pressure will vary, rising with increase of temperature. Hence vapor pressure determines the proportion of gasoline vapor that a given volume of air will take up."



Test on diaphragm type pressure valve with mercury manometer showing operating pressure of 3.2 ounces per square inch. Note: Valve is provided with cover for regular duty

In a more recent Bureau of Mines publication, Serial No. 2834, Ludwig Schmidt reports the results of a test to determine the "Reduction of Breathing Losses from Vapor-Tight Lease Tanks" and makes the following statement:—

"The results of this test and other tests on lease storage show that a tank equipped with a pressure relief valve, operating at 14 to 16 ounces pressure will reduce the evaporation losses about 60 per cent, as compared with a tank equipped with a relief valve holding about two ounces pressure, with other conditions equal."

This is true for the conditions governing this type of test where a small tank has been used to receive oil from wells making a small daily production, in other words where the oil had to be held in the tanks for some days before it could be run to the pipe line and the evaporation due to breathing would therefore have been appreciable, if the pressure relief valve had been of the very low pressure type.

For the small tank under this condition the higher pressure is desirable, for during the day the vapors above the oil will be heated and expanding will attempt to escape from the tank, and at night when the temperatures of the atmosphere are lowered the vapors will contract and air will be drawn into the tank, which must be saturated with the lighter hydrocarbons from the oil, and this continued process will in time cause an appreciable loss in the oil produced.

It is estimated that for each five degrees of increase in temperature there is an increase in pressure within a tight tank of about 1 ounce due to the expansion of the vapor above the oil.

Numerous records show that the average daily temperature change in the Mid-Continent area is about 45 degrees, so on this basis of one ounce increase in pressure for each five degrees of temperature there would be a total increase of about nine ounces pressure within the tank during the day, with the like decrease in pressure at night in reducing back to the original temperature of the atmosphere.

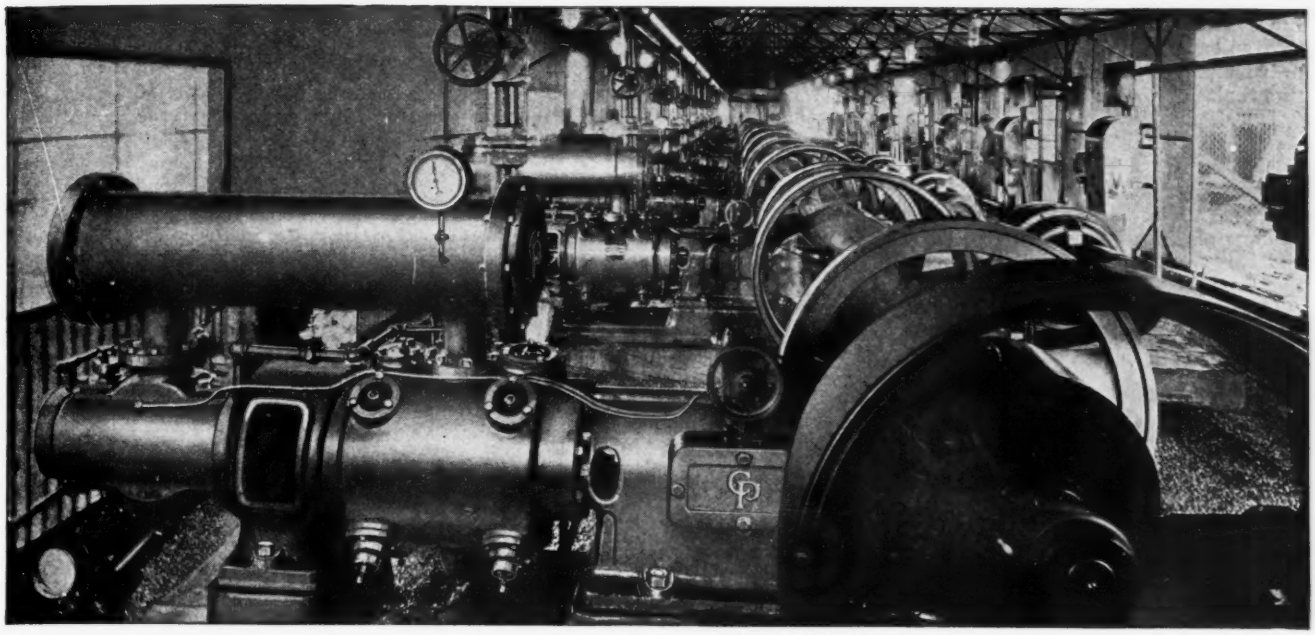
It therefore would seem that for practical purposes a tank sealed at a little above nine ounces pressure would be effective in holding within itself the total amount of vapor it originally contained even under the conditions of expansion set up by the temperature increase. This volume increase would be contracted back to its starting point during the cooler periods, and no air would then be drawn into the tank during that operation and conditions would be ideal.

If during the operating period additional gas from the well was forced into the tank at pressures in excess of nine ounces, or the valve capacity, this excess gas would escape to atmosphere, but only in such excess volume as might be delivered from the well, so under such conditions the vapor body over the oil would still remain unchanged and evaporation would be retarded.

But for tanks that are required to handle flow from wells producing naturally there is always an excess of gas and if this is not passed to the casinghead gasoline plant for reduction to gasoline it is passed to the atmosphere as waste and to seal a tank to any appreciable pressure to retard the free flow of such gas seems unwise. If it must go to the atmosphere the main object of the valve should be to permit it to do so with the least effort exerted upon the tank. During periods when there is no excess gas to pass to the atmosphere the tank should be sealed by the valve to prevent air from entering the vapor zone above the oil to rob it of its lighter hydrocarbons that readily combine with the air.

If the gas is to be passed to a gathering system for use in a gasoline plant it has been found best to handle the excess gas from the tanks through pressure regulators set between the tank and the vacuum gathering line that is carrying the gas to the plant.

If a sufficient pressure is built up within the tank, say six ounces, to permit of ample difference between the minus pressure or partial vacuum, say 6 or 7 inches of mercury in the gathering line the pressure regulator will function at any time the tank pressure



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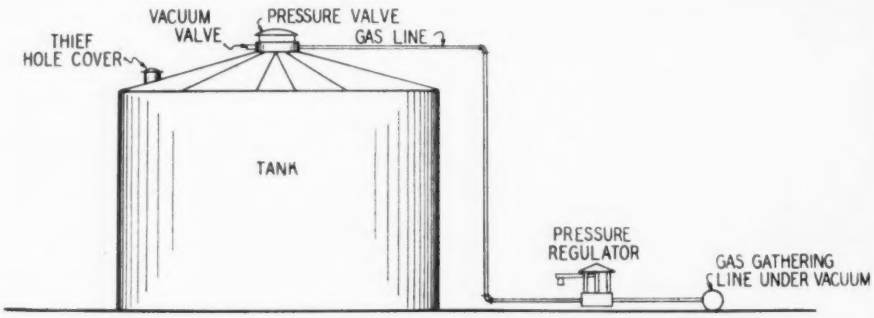
falls below a safe working point and this will close the regulator valve and prevent any vacuum being pulled on the tank.

This is most desirable for many reasons. If it is attempted to build up sufficient pressure within the tank to force the gas into the gathering line it must buck against an appreciable amount of line pressure in the system and this puts unnecessary pressure on the tank.

If any attempt is made to draw the gas away from the tank by the application of a slight vacuum to the system the tank must be supplied with vacuum relief valves and the chances are that these valves will remain open a large percentage of the time and the gas will be diluted with air and this will cause the overloading of the gasoline plant, in a sense, for it will be required to handle an increased volume of vapor and the gasoline contents per thousand cubic feet is reduced.



Layout of tankage where gas is taken from lease storage to gasoline plant

The ideal gas gathering system consists of a tank equipped with pressure relief valves set for a pressure sufficiently above the operating pressure within the pressure regulator to insure positive operation of the regulator and also relief of the tank from excessive pressures if there is more gas entering the tank than can be carried away.

Also a system of vacuum relief valves that will insure the relief of partial vacuums within the tank if for any reason the vacuum from the gathering line is passed on to the tank.

Vacuum is in a way more likely to rupture a tank than pressure for when pressure starts to expand a tank the change in shape is very noticeable to anyone nearby and a valve can be opened or the source of the pressure cut off and the tank saved from damage. With vacuum the deck is the only part that would normally show the effect of the reduced internal pressure and this fall in pressure within the tank can happen very rapidly in some cases and the tank fail before means can be applied to save it.

It is therefore most important to equip a tank with a vacuum relief valve that will open under very slight change in internal pressures below atmospheric and will be so designed that a large volume of air can enter the tank through the orifice made by the valve seat and body without building up additional partial vacuum.

The flat weight type of vacuum valve does not seem well suited to this requirement, for it forms a round-about passage for the air to enter the tank and this in itself will cause the internal minus pressures to increase, and inasmuch as vacuum valves are not required to operate except in extreme cases on tanks that are properly operated it is quite probable that the vacuum breakers might remain inactive for a long time and might stick to its seat and require more than the safe strength of the tank to open it, so the tank is damaged before the valve functions.

To get some idea of the relation of strains on decks set up by external pressures due to partial vacuums within a tight tank, let us again compare the 10 foot and 30 foot tank decks.

The area of the 10 foot tank is about 11,310 square inches and if the pressure difference between the inside and outside of the tank is minus one ounce this would mean an added load of 832 pounds on the deck, and for the 30 foot tank with its area of 101,787 square inches the one ounce differential in pressure would add 6361 pounds to the load on the deck.

This load might be applied very gradually without noticeable effect, but vacuum seems to work very suddenly so in effect it is the same as dropping over three tons on the deck of the 30 foot tank very suddenly and without special inside braces the deck is liable to fail.

It is not meant by this that one ounce below atmospheric pressure will cause failure of the tank under vacuum conditions, but if a vacuum breaker is set to operate at 2 ounces and should stick, there would be under normal conditions a pressure of over six tons on the tank deck in addition to its own weight, and the valve might still fail to operate until the vacuum within the tank had been increased to four or five ounces and the load would then be too great for the deck to support.

Deck supports can be designed to carry excess loads but competitive conditions in the tank business makes it necessary to place reliance in the vacuum valves operating at low minus pressures rather than add to the selling price of the tank by increasing its manufacturing cost.

The vacuum valve that has given good service for both lease and pipe line tanks is built on the swing check valve principle and set to open at about ½ ounce below atmospheric pressure. Manometer readings on tanks equipped with such valves showed that they functioned very reliably and in one instance where a 5000 barrel bolted tank was being emptied at the rate of about 1000 barrels per hour the 4 inch swing check type vacuum breaker would remain full open for about 20 seconds and then close for about ten seconds to again suddenly open when the fluid level in the tank had dropped to a point where it had displaced the air within the tank and created another ½ ounce vacuum condition.

The suddenness with which this valve would fly away from its seat when the critical pressure within the tank was reached was an excellent example of the force of the vacuum acting within the tank and the resultant pressure upon the roof of the tank.

Attempts have been made to combine into one piece of apparatus thief hole covers, pressure valves and vacuum breakers and while there are some advantages to be gained by the use of such equipment there are other inherent faults in the design.

It is almost an absolute necessity to have a spring actuated vacuum valve in this type of equipment, and any spring actuated valve is unreliable for light working pressures such as found around lease or pipe line work tanks.

As a matter of fact the vacuum breakers in such valves are seldom called into use for the practice is to prop the whole valve back from the thief hole opening while the tank is being run and this relieves the tank of any tendency to build up a vacuum.

At the same time the oil is subject to some evaporation losses and gas will escape from the thief hole and this may be the source of fire hazards about the battery.

Valve seats have caused much concern to designing engineers and practical field men for rubber in the presence of the vapors arising from the surface of oil has a tendency to absorb moisture and expand and the usual thing is for them to "creep" in their seat or groove or wrinkle so that they no longer offer an even surface for the valve weight. Many ideas have been suggested to overcome this trouble and all kinds and shapes of gaskets have been tried and mostly discarded. The solution seems to lie in the direction of using a rounded metal seat and a flat comparatively soft rubber valve disc and holding the disc against the metal seat by means of a weight placed on top of the disc or hung under the disc upon a stem, the stem to also act as a guide for the operating valve.

This type of pressure relief valve has other features that are desirable

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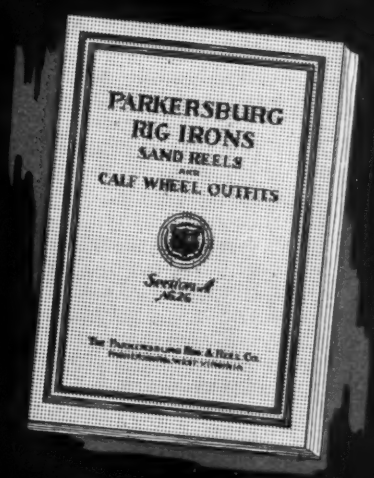

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and they are that there is small chance of the vapors coming in contact with the metal to freeze and form ice or frost that will make the valve inoperative except at pressures much in excess of those desired for the tank's safety. Again when this valve does leave its seat it will present a free opening and the amount of back pressure built up within the tank will be minimized.

The valve seat can be readily renewed and this will give opportunity to keep the apparatus in first class condition at all times. Tests have shown that with a good seat this type valve does not leak vapor or gas and will not open at partial pressures below those for which it is designed.

Because of the fact that the human equation presented by field workers must be considered in all operations it has been found desirable to give consideration to the designing of a thief hole cover that will act as a secondary relief for excess pressure within the tank and if the valve should fail to open or being open does not have enough volumetric capacity to permit the gas to escape rapidly enough to prevent the building up of excessive back pressures this thief hole cover will open to permit the escape of additional gas.

When tanks are sealed with this type of apparatus and orders issued to the field men to see that the tanks are kept tight at all times, the field men must be assured that the different valves will function at the predetermined pressures or vacuums.

If experience shows the field man that this is not a fact he is going to allow the thief hole cover to remain open at all times as a protection against damage to the tank for he is not judged so much by the gravity of the oil he passes through the tanks as by the condition of the tanks.

In other words, if a tank fails for any reason whatsoever the lease man is criticised and naturally he is going to avoid such criticism if possible. This is only natural, for self-preservation is the first law of nature.

On the other hand if the production companies and pipe line companies would judge the work of their field men by the quality of the product they turn out and give them due consideration in the event of tank failures it would be found that better results would be obtained all along the line.

The equipment should be of such design that it can be easily examined and any changes needed made without the use of special tools. The tank foreman should be required to make daily report of the condition of the apparatus on the tanks as well as upon the condition of the tanks themselves and this daily inspection would soon lead to a complete understanding of the characteristics of the valves and knowing them fully they would be operated as intended.

When oil was selling at much higher prices this agitation regarding evaporation losses was at its height, but now that oil is bringing much lower prices and there is an actual surplus in sight there seems to be a tendency to overlook the fact that it is still good policy to handle the oil in tight tankage from the well to the refinery.

The use of the cracking processes in refining oils has increased the gasoline yield and this offsets in a measure the former losses due to evaporation, but it does not in any degree reduce the actual quantity of oils lost due to careless handling of the material.

The value of tight tankage is generally admitted and most large companies consider that they are operating their tankage with gas tight equipment, but field observation in many districts shows that the full value to be derived by such equipment is not being secured because of the general practice of leaving thief hole covers open.

This comes about because of a division of responsibility at the time the oil is actually delivered from the production company to the pipe line company.

As the oil was produced all losses would be chargeable to the production department and to prevent these losses being excessive equipment is supplied to make the tanks tight. This may or may not be properly used, but it is generally supplied.

But when the oil is sold to the pipe line company their gauger will check out a tank onto the line and will leave the gauge hole cover open to insure himself against possibility of the tank being damaged due to partial vacuum being set up in it while the oil is being run.

The oil belongs to the pipe line company and they can do with it as they desire, for they have already covered their possible losses by making a 2 or 3 per cent deduction from the gross contents of the tank, so they protect themselves against damage to the tank by opening the thief hole covers and leaving them open not only while the oil is running to their pipe lines but afterward for they do not go back to the tank again until it has been again sealed and made ready for another filling.

This practice of leaving the thief hole cover open during emptying the tank leads to a more serious practice followed by lease men of leaving the thief hole covers open at all times even when the tanks are being filled.

The cover may not be propped back but in many tanks the thief chain or chain to the thermometer is left under the cover of the thief hole and this prevents any pressure being built up within the tank for it is always open to the atmosphere.

These conditions are not mentioned as criticism of the field men, for the fault, if any, goes further back than there and should be remedied by the heads of the production companies and the manufacturers.

The manufacturers of lease storage tanks of either the bolted or welded type should also provide pressure valves and vacuum relief valves that will be positive in their operation. The production companies should make certain that these pieces of equipment will do what they are intended to do and then issue hard and fast rules that they must be used properly and in the end the gain will be noticeable and more of the light hydrocarbons will reach the refineries.

It does not seem at all logical to attempt to hold very high pressures on the lease storage tanks for even if it were a fact that the tanks could be sealed at pressures to prevent loss due to evaporation at the vapor pressures of the oils there would be no permanent gain by such practice for when the pipe lines purchase and handle the oil they cannot do so under these abnormally high pressures for it is then passed into larger tankage and this, without it is especially built will not stand pressures equal to the smaller lease tanks.

When the oil is later passed to 55's or 80's for final storage it is again handled under pressures but little above atmospheric and if the pipe lines had maintained those high pressures and the very light hydrocarbon fractionations in the oil it would be lost here.

So it would seem logical to give due consideration to the proper working pressures suitable to all conditions on the lease with direct relation to what will be the final working pressures for the tanks to which the oil is finally passed.

Undoubtedly it is good practice to handle the oil on the lease under slightly higher pressures than those that will exist in the 55's and 80's but to start the oil on its way to the refinery through tanks equipped with valves that will function at pressures around one pound per square inch only tends to put undue strains on the work tanks on the lease and cause frequent failures.

This tendency to cause failures leads the lease men to protect themselves by leaving the valves open or slightly cracked, and without recording pressure gauges on the tanks it is impossible to determine at what pressures the oil has been actually held and handled.

So why not reduce the tank valve pressures to very little above atmospheric pressures, say about three or four ounces when handling oils from wells that will fill the tanks quickly and where it is not desired to utilize the gas for casinghead gasoline or other purposes, and then the pipe line companies can handle this oil at pressures about 1½ ounces which will still give a good seal and prevent anything but the higher fractions from escaping.

When the oil reaches the large riveted tanks for final storage it can

(*Continued on Page* 154)

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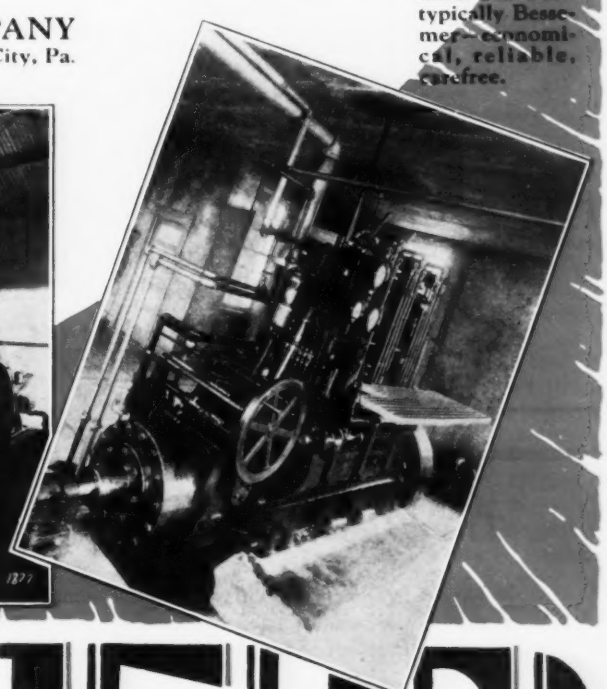

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be sealed at pressures around ½ to ¾ ounces above atmosphere and if this is constantly maintained above the oil it will reach the refinery in condition to permit an extraction of the maximum amount of gasoline for the given type of oil being handled.

This practice is justified, for every barrel of oil produced has cost something and this production cost will be lost to some branch of the industry if due care is not exercised in handling the products from the well to the refinery.

The American Petroleum Institute has a committee working on standard tank specifications and while they are desirable they will only partly serve their purpose unless the valves and accessories are properly designed and operated.

At this time there is no standard test for pressures and capacities of either pressure valves, vacuum breakers or thief hole covers and it is thought that some form of test for this purpose should be devised and when valves are rated at certain capacities they should be certified to by a plate bearing full information and issued under the auspices of the A.P.I. similar to the practice now followed in rating derrick capacities.

Some manufacturers of tank accessories are now making tests on their equipment and issuing graphic charts showing the results and in some cases giving similar results of competitive equipment, and it has been noted in some instances that the same type of valve under different test conditions show widely different curves.

This is more likely due to the fact that the engineers making the different tests are not in agreement as to what should be the governing factors of the test rather than any desire to give biased tests on the equipment under consideration.

It therefore seems very essential for the American Petroleum Institute to step into this breach and after due consideration outline what will be Standard Test Conditions and then the manufacturers and consumers can fully understand one another and tanks can be equipped with fittings that will give any result desired by the owners, and they can issue orders to the field men regarding operating conditions that can be followed without undue jeopardy to the safety of the tank.

This is a problem in conservation even if at this time there is a surplus of oil in this country and inasmuch as the industry sometime ago agreed upon the desirability of preventing undue evaporation of petroleum in its handling, let it now agree upon standard method by which these results can be accomplished and put into practical use in all fields, whether handling low priced sulfur oils of West Texas or high gravity crudes of Oklahoma or Pennsylvania.

Recording and Control Instruments Essential in Producing

By W. M. Emery*

IN THE evolution of every industry, instruments have played a dramatic part. What the faculty of sight, speech and intelligent action are to the human being, instruments are to our intense industrial and mechanical civilization. Like the human qualities they are often taken as a matter of course, and perhaps not fully appreciated or used to the greatest advantage.

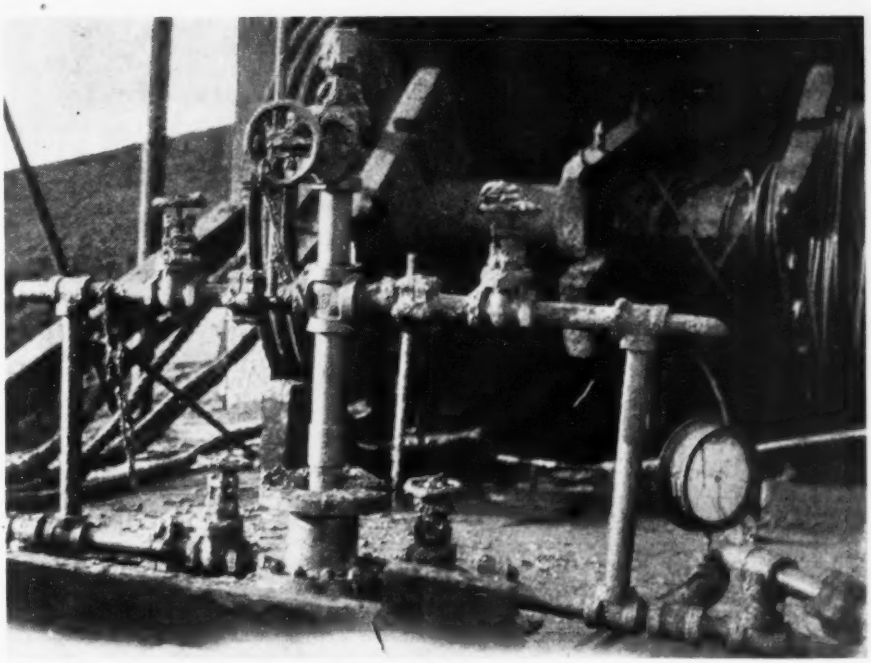
The first instruments were indicating only. From a mechanical standpoint they gave sight to industry. They have pointed the way and served as the "compass of industry." Then value, however, was dependent on an immediate observer, so that next came the recorders, which may be considered as the "speech of industry." Finally instruments to perform human operations were developed. These were the controllers, the "Robots of Industry."

Sometimes, during industrial development, the instruments were already available in some form and had only to be adapted to new applications. Other times they were newly designed to meet some particular need.

The natural gas and gasoline producers had a problem of measuring gas from individual leases. Many different kinds of meters were used, but were not satisfactory, and finally the orifice meter was designed and perfected to meet the demand. Now it is used almost exclusively in the measurement of large volumes of wet and dry gas.

Previous to the advent of the recording differential gauge, the indicating pressure gauge or an occasional recording gauge constituted the bulk of the instruments which were used in the production department of an oil or gas company. However, all this was before we were introduced to petroleum and production engineers, before oil field engineers became interested in every form of conservation, before the time when "cheap oil" had to be produced and still leave a margin of profit. Competition, the originator of conservation, now stalks the oil and gas producer; and a record of what he is doing as well as an office record of how he accomplished certain results are an absolute necessity.

A field trip through a present day oil field will reveal almost every recording instrument one might expect to find in any highly specialized industry. Moreover, automatic controllers, instruments which were once considered applicable only to manufacturing processes and highly industrialized trades, are now a standard tool to be used by the field man. The producer now controls many of the every day routine tasks of the lease with these instruments. In discussing recorder applications, it would probably be best to take the recording and recording controlling instruments in the order of their advent into the production of oil and gas, and thus recount the present application they fill.



Recording gauge on discharge of gas lift well in the Texas Panhandle showing severe conditions under which it is employed. Note paraffin accumulation

In doing this we would naturally take up the recording gauge first. This adaption step was not a long one, since an indication of the flow line pressure of a well was always deemed advisable. The old indicating gauges first used were often cheap ones, but even their fluctuations told a story to the close observer; and the recorder was only a mechanical substitute for the close observer. Now, recording gauges have many applications, drawing a record of the phases of oil production which give vital information. Some of the critical well conditions shown by recording gauges are water encroachment, gas decline, necessity for gas lift, pumping conditions, and various conditions encountered in repressuring.

On the natural flowing well, back pressure is often maintained to control the gas/oil ratio. Since this back pressure is practically constant from day to day any signs of water encroachment will affect the back pressure gauge reading immediately, because of the extra weight of the gasified oil column due to the presence of water. Any sudden drop in pressure on a recording pressure gauge gives warning of water encroachment—the moment it occurs. Thus the recording gauge is used not only to give a record of back pressure, but also by an interpretation of its record, shows water encroachment.

A further use of the same gauge gives valuable information of gas decline. Gas declines are slow but bring an increase in weight of the oil column, therefore a gradual decline of back pressure. The same gauge used to indicate water encroachment also indicated the heading condition of the well and shows when gas lift should be applied to keep the well from "going dead."

Many times a heading well can be tubed with a smaller oil string and

*District manager of the Foxboro Co., Tulsa.

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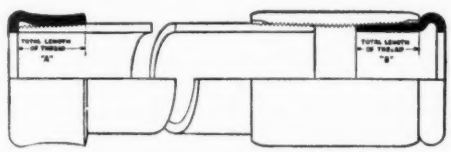

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thus prolong the life of the well on natural steady flow. The gauge tells when this should be done. In some oil fields (Panhandle) this same gauge will indicate paraffin restriction in the tubing, the flow line or the well head itself. After the well is on gas lift the gauge still gives valuable information. It helps the roustabout when he is "rocking" the well to "kick it off," running the paraffin scraper, or steaming the well head.

When a well is put on gas lift a two-pen pressure recorder is often used, one pen recording pressure on the inlet gas to the well, the other recording pressure on the discharge. From these it is possible to manually regulate the amount of gas necessary to flow the well steadily. An insufficient amount of gas to the well results in an irregular inlet pressure record, and tells when the well is heading. An irregularity of the discharge pressure usually indicates too much gas.

Of course, when controllers and meters are used, these instruments give the inlet and outlet pressures directly.

When the time comes that a well is to be taken off gas lift and put on the pump, a record of the pressure in the flow line from the pumping well gives an indication as to when the rods should be pulled, when new cups are needed, or when the standing valve is not seating right. Recording gauges placed on the flow lines from pumping wells will greatly increase efficiency and therefore help production.

Recording pressure gauges are also used in production work for measuring gas flows to atmosphere. When gas is released to the atmosphere it should always be measured even though roughly. An open flow well tester installed on the gas line from the gas trap or separator is generally sufficient.

When used on the well tester a recording gauge is much more satisfactory than an ordinary U-tube and on high pressures is the only practical gauge. This method of recording the flow does not depend on note book entries or envelope notes, but gives an actual chart record of the flow.

On a great many low pressure atmospheric gathering systems two-pen recording gauges are used in measuring the flows from the wells, especially where several wells are combined into a common flow battery with but one meter. A two-pen recording gauge, giving the pressure on each side of an orifice, gives a very close record of the flow from the well under test.

When only a weekly check on each well is desired a two-pen portable recording gauge answers the demand perfectly. The latest portable gauges have aluminum cases and doors for lightness and are equipped with many practical conveniences.

Another very useful application of the pressure gauge is recording of the rock pressure in repressuring work.

To obtain the actual rock-pressure in repressuring fields it is necessary only to shut off the gas supply to the input well and read on a recording gauge the lowest even pressure obtained. This even pressure is usually obtained within one to three hours on porous sand and rarely ever more than eight hours on tight sand. This allows to be checked up, without delay, the rock pressure in every portion of the repressured field. The porosity of the oil sand structure can usually be approximated from this data as the drop across the face of the sand is the difference between the normal operating pressure and the rock pressure.

For repressuring test work a portable recording gauge with a one-hour chart is the most satisfactory. It is well to note that clocks can be furnished in chart speeds varying from 15 minutes to 7 days. A fast chart allows minute changes to be read easily and where analysis of condition is desired, as in test work, such an open record is invaluable.

The design of instruments for the oil industry, and particularly the production department, calls for the instruments to meet distinct and individual conditions. Some of the sternest requirements are simplicity, ruggedness and reliability.

Instruments often have to operate in the open subject to great extremes of temperatures. They have to meet corrosive conditions and stand up against overrange conditions. They cannot have the attention that instruments in some other industries receive. (Notice the operating condition of recording gauge in the cut).

Much effort has been spent in developing instruments to their present design and improvements are continually being made. Chrome-nickel steel movements, to withstand corrosive conditions, are now available. Quickly removable pen arms allow anyone to replace a damaged pen arm in a few seconds without disturbing calibration. Previously this was an expensive repair job. Permanent calibration has been built into recording instruments and expensive calibration in the field has been largely eliminated.

When the orifice meter came into the oil field it was universally adopted for the measurement of both wet and dry gases. To expand on this particular recording instrument and its applications would mean an article on meters. It is sufficient to say that this one recorder is the most versatile instrument the field engineer possesses. Where accuracy and great sensitivity is an acquirement, when arriving at volume or combination of volume and pressure, it is always considered good practice to use the orifice meter. Most production engineers have made a common practice to resort to a permanent orifice meter setting to each well when volume records are required, rather than depend on instantaneous reading of a well tester. On the wells effected by water encroachment, gas decline and the like, it is true that the differential reading on the orifice meter is much more sensitive to changes than the recording gauge, and makes the ideal permanent installation.

It was not until the 1926 entry of gas lift into the production field that the many types of controllers were introduced to the producing fraternity. Now the controller terms: Volume controller, rate controller, temperature controller, and precise pressure controller; are all common field terms. This is more particularly true of the volume controllers since they are used both in gas lift and in oil sand repressuring work.

The success of many a gas lift program hinges around the ability of the operator to make sure the correct volume of gas is reaching each well. The volume controller makes an ideal instrument for this. The record from the instrument gives a definite measurement of the amount of gas delivered. The pressure record gives valuable information as to the amount of gas required and the controlled differential automatically maintains the desired rate closer than an operator can possibly do manually. To deliver the desired amount of gas manually means that an elaborate header system must be installed and diligent watch maintained by the operator. A change in setting of one valve in the manifold usually disturbs the amount delivered through all the other valves unless a greater amount of gas is being used than is needed. Most gas lift wells under this method are operated with an excess of gas in order that manual control is not so sensitive. When volume controllers are used, the elaborate header system is done away with, for each well then has an automatic, controlled flowing volume. With this system in operation each well is so adjusted that it is an efficient flowing unit, thus all excess gas is absorbed in the common header which precedes the individual well controllers. Many gas lift plants have increased production, increased gas lift efficiency, and decreased plant operating costs by the proper use of volume controllers.

Many improvements have been made in volume controllers since first they were used. Controlled valves which stand up against severe corrosive action are available, changes to simplify adjustments, both in valve and instrument itself, have been made. Volume controllers built around the latest in orifice meter design are just now becoming available.

Undoubtedly the most recent control application in the oil producing industry is that of the volume controller for repressuring. Some of the information available from recording gauges on repressuring has been prev-

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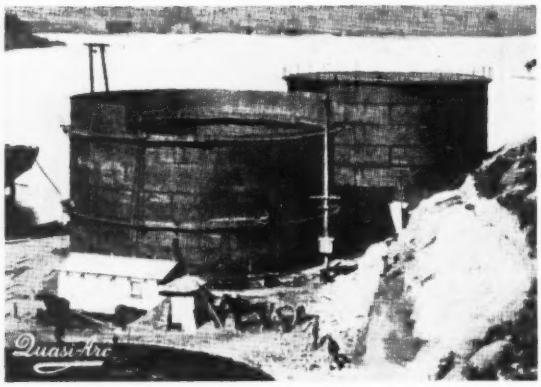

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iously mentioned. The volume controller gives this plus automatic control of conditions, which if left to manual operation, may result in the necessity of abandoning the key well, or the complete failure of a repressuring project.

For repressuring to be beneficial the gas or air must penetrate the sand slowly and evenly, in order to cause no disturbance of the sand structure. The gas under pressure tends to migrate in all directions, the greater volume following the line of least resistance. When a lowered resistance in any particular direction exists, the increased velocity of gas through the sand tends to so disturb the sand structure that channelling to an adjoining producing well results; or, if the strata contains fine sand this sand may so be carried along as to cause jamming.

The volume controller always works in the direction the producer desires, namely controls the one uncontrolled factor of input gas volume. Installed on the input gas line to the key well, it will deliver the desirable maximum volume, and until reset at some higher differential, will reduce the volume in proportion to the tendency of the sand to receive gas.

Thus, the volume controller is a watch dog standing between the high pressure header and the low pressure key well, and automatically guarding against the start of serious by-passing or its resulting jamming.

If one has a volume controller on the input gas, which holds the differential constant and depends on the well to hold the pressure constant, the tendency of channelling of the gas sand is kept under control.

The continual improvement in instrument design to meet individual conditions, and the increase in knowledge as to their use and application are fast making instruments for use in oil production as valuable and necessary as they are to the refining and gasoline industries.

Sil-O-Cel Insulation Described

LOS ANGELES—Methods of insulating employed by virtually every furnace designer in the country for electric and fuel-fired furnaces for heat treating work, are illustrated with drawings in the new booklet on "Insulation of Industrial Furnaces and Ovens" recently published by the Celite Products Co. here.

The booklet describes and illustrates the use of Sil-O-Cel insulation in many types of metallurgical equipment and tells how that product saves heat in practically every part of the process.

CANTON, O.—Walter G. Hildorf, who has been metallurgical engineer for the past several years for the Reo Motor Co., Lansing, Mich., has been placed in charge of all metallurgical work for the Timken Steel & Tube Co., Canton, effective Oct. 15.

Gas Lift Method Raises New Problems In Figuring Depletion

By W. A. W. Krebs*

THE gas lift has overturned a number of beliefs and methods. Among those so disturbed are the methods of figuring depletion. The answer to the trouble which depletion engineers are having has not been found. Mr. Krebs, with many years' experience in this work, tells in this article of some of the difficulties of calculating reserves where gas lift is employed. Whether this producing method merely hastens the rate of recovery or whether it actually increases the final recovery is an unknown factor and one which is all important. Mr. Krebs does not attempt to give the answer, but his article is certain to lead to constructive work which finally will afford valuable results.

OLD in principle, rejuvenated in its application, the so-called air-gas lift, as now applied to oil production probably has been more far-reaching in its effect than any improvement in method adopted by the petroleum industry in its various phases since the advent of the cracking processes for gasoline recoveries.

The extent of this effect is not yet adequately measured. As a result, its use has confronted the industry with new problems which are as yet unanswered with a definiteness to be desired.

To those engineers engaged in valuation of oil properties, and others dealing with "depletion on cost" for tax purposes the question of the effect of the lift on depletion seems worthy of most careful investigation.

Certainly, at this time, young as the present application of the process is, no definite rules or theories can be laid down. The purpose of this article is but to direct thought to the desirability of the determination and hasten, if possible, a more complete study of the results of the process.

Two things stand out pre-eminently at this time. The first is that, in the Seminole pool, great quantities of oil have been recovered in a very short time. To what extent the lift has been responsible for this result cannot yet be definitely answered. Certainly its contribution is far from negligible. The second recognized fact is that a natural flowing condition of production is the ideal method of recovery. These two facts are admitted by all.

In connection with the large quantity of oil recovered from the Seminole pools, it is interesting and somewhat illuminating to note that from the Cushing pool of Oklahoma, which covers an approximate area of some 21,000 acres, there have been recovered, from beginning of production to approximate date, some 284,000,000 barrels of crude. From Seminole, in extent approximately 15,000 acres, there have been recovered, during its very brief existence, approximately 216,000,000 barrels. To put the comparison another way—Seminole productive area is to Cushing productive area, approximately, as 5 is to 7, and yet during the very short period of Seminole productivity it has produced approximately ¾ as much oil as Cushing has produced in its entire history to date. Based on the productive acreage and production approximations above set forth, we find that, to date, Cushing has produced 15,666 barrels per acre average, while Seminole has produced 14,400 barrels.

Factors such as sand porosity, saturation and similar conditions undoubtedly must be taken into account in drawing conclusion from such a comparison, but even with due allowance it seems evident that the lift process in use at Seminole has contributed in no small measure to the comparatively quick recovery there.

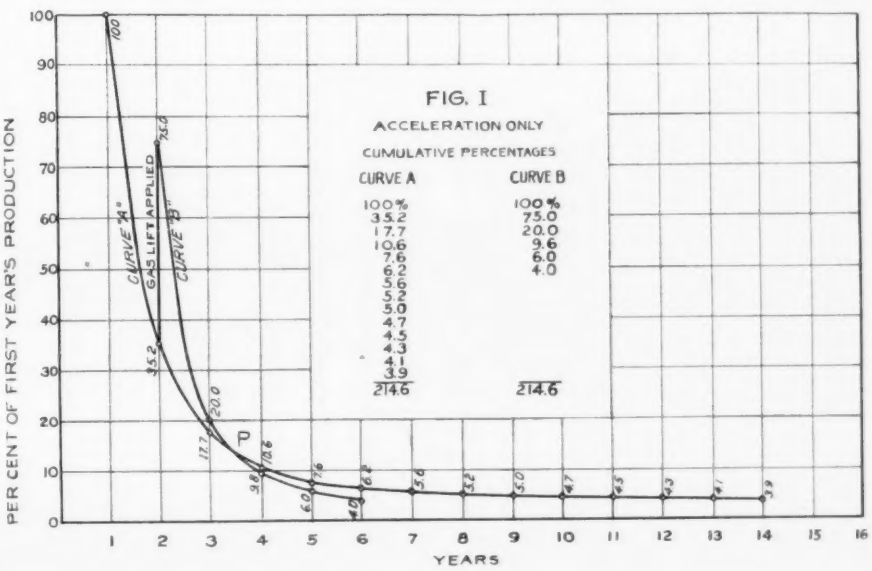
The general recognition by the industry that conservation of the gas is essential to maximum recovery of oil is well put in Bulletin No. 148 of the U. S. Bureau of Mines, which says, in part:

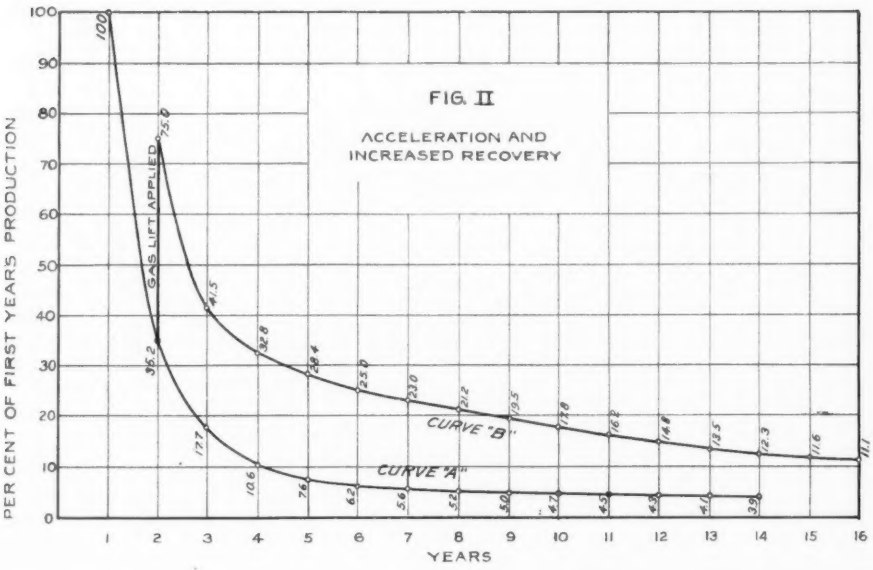
"There is a definite and limited amount of natural energy associated with the oil in each field, and largely upon how effectively that energy is utilized to expel the oil from the sand will depend on what proportion of the oil in the sand may be recovered, for evidently the exhaustion of a well is caused more by the exhaustion of the natural expulsive forces than by the depletion of the supply of oil. If the natural gas associated with the oil is permitted to escape unrestricted and without performing the greatest amount of work possible, the producer is lessening the quantity of oil that may be obtained by natural means."

The purpose of the gas lift, as is well recognized, is to simulate or substitute for a natural condition, such as we find in the flowing well, where the compressed gas is associated with the oil, and the expulsive force of the gas carries the oil with it to the surface.

If we could take control of the expulsive gases at the beginning of production and would carry this control on through the life of the well, we would be able to conserve the useful gases, causing each cubic foot of gas to do its allotted portion of work in lifting oil, and thus obtain greatly increased production over the life of the well. Then, as the nat-

*Engineer, R. M. Hays & Co., Tulsa.





ural expulsive force was depleted, if we substituted, through the principle of the lift, residue gases and could keep the pressure on the sands near its original pressure, we would have the ideal condition realized.

Under actual working conditions as they now exist, we find that usually a well is permitted to flow naturally until the decline in production reaches a point where it is deemed wisest or desirable to stimulate the flowing by artificial means. At this point, the lift is applied and an attempt made thereby to restore the former association of gas with the oil and at a pressure sufficient to flow the oil from the sands to the surface. Here again, over a period of time, the platted curve of production shows a decline. It has been found advisable, in some cases, then to discontinue temporarily the artificial pressure of the lift process, and put the well on the pump, relieving the back pressure apparently set up on the sand. Once again the decline sets it, and we may find a return to the lift process advisable.

This change from natural flow to lift, from lift to pump, and then back again to lift, has naturally played havoc with the regularity of decline curves based on natural flowing or pumping conditions.

The real problem of valuation or depletion is the determination of recoverable reserves. The application of the lift at Seminole, in particular, has demonstrated that either we have greatly accelerated the recovery alone, or we have both accelerated and increased total recovery. The crux of the problem lies in determination of the amount of acceleration and the amount of increase over former recovery methods.

If we would assume that the process produces acceleration of recovery but with no increase in total ultimate production, we might expect an approximation of the decline curves to be about as sketched in Fig. 1.

Here we have a hypothetical case where curve A represents decline of production under conditions of non-stimulation, aside from ordinary pumping methods, and which curve is represented as having an ultimate cumulative percentage of 214.6, in terms of the percentage of the first period.

Now assume that instead of permitting the well to decline without stimulation we had, during the second period, applied the gas-lift, and found that as a result our production was 75 per cent as great for the second period as we had in the first. Then, on the presumption that our decline followed the general decline as depicted by curve B, and that no additional recovery would be had by use of the lift system, we would reach our total ultimate cumulative recovery at the fifth period, instead of at the fourteenth, as in curve A.

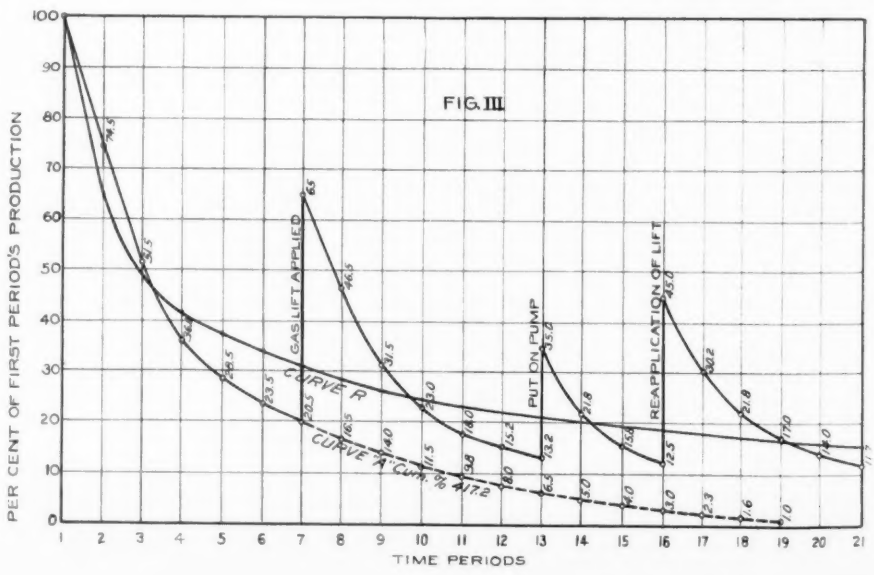
In other words, the curves would indicate that we would get the same total yield of oil, but at a greatly accelerated rate. The first two periods would yield us 81 per cent of our total ultimate recovery, instead of 63 per cent. Incidentally, the intersection of the curves at P, would indicate the point at which it would seem advisable to turn to pumping, rather than gas lift, if oil prices justified accelerated recoveries.

If on the other hand, we assume both acceleration and increased ultimate yield, as seems reasonable and to be expected, as the effect of the lifting process, we may visualize results somewhat from the sketch reproduced herewith as Fig. II.

Here we have the gas lift applied in the second period, as in the previous case, but with curve B showing increased production throughout its entire length, and some periods beyond the economic limit as given in Curve A. Here the cumulative percentage of recovery in "A" is 214.6 per cent over the life of the well, while in "B" it is 441 per cent for the same 14 periods and extends on beyond. If we had figures representing the average decline of a large number of wells of which the two curves given herewith could be considered as typical, we could then arrive at some definite idea of the possibilities of increased production from the operation of the lift process.

In actual practice we have other factors to deal with also, which to some considerable extent "muddy the water." The alternation from flowing naturally to gas lift, from gas lift to pump, from pumping back to gas lift, etc., gives a jagged production record, difficult of defining average decline and ultimate total yield.

In Fig. III, we have attempted to depict this condition of operation. Curve A represents what is presumed to be the natural decline of the well, under ordinary methods of production. However, we are presuming that the operator, sensing his decline, applied the lift in time to raise his 7th period yield back to 65 per cent of the 1st period's yield. Continuing to operate with the lift then until after the 12th period when he concluded the pressure on the sand was retarding rather than accelerating his production. At this period he discontinues the gas lifting process and puts the well on the pump. We have presumed an increased yield at the 13th period,



putting the production back to 35 per cent of the first period Continuing to pump, his decline sets in once more, and before the 16th period he has again returned to the lift, with an increase in production as a result. Disregarding the figures used in these illustrations, which are arbitrary and more or less meaningless, and looking to the result, we see actually four separate and distinct decline curves. Undoubtedly, the resultant curve from these four would be a compound curve. However we have set up here, Curve R; not a resultant, but rather a hyperbolic curve of the same total ultimate cumulative yield as the four separate curves combined. This curve, while not reflecting the true yield for any particular period, would show, by its projection to economic limit, the total yield that might be expected, provided no further change in method were taken to materially disturb the producing conditions.

Several of the companies operating in the Seminole area have a large amount of data on the production of both individual wells and leases. Much of this has been platted. But the engineers of production have been so busy studying the idiosyncrasies of individual wells, catering to their indications of best production under this or that particular pressure, and problems of similar nature, that this material for study of the question of the effect of gas lift on ultimate production has been left largely undigested and unassimilated.

Thus far conclusions drawn have been on the basis of individual units, usually single wells, and general conclusions as to result have been passed by.

Geological departments have an admirable practice of drawing on entire areas and districts for information upon which to base conclusions of a general nature, and then applying the general conclusion, duly modified by local conditions, to their particular problem. Would it not be well for production engineers to scan the horizon, beyond the properties in which they are immediately interested, for the purpose of assembling facts upon which general conclusions can be based? Only by the comparisons of conditions and factors affecting a large number of units can reliable conclusions safely be drawn.

Whether total ultimate recoveries under lift process will be 20, 40, 60 or 75 per cent of total oil in the sands, as against estimated recoveries of some 20 per cent by older and ordinarily used methods, no one can definitely say, at this time. However, we feel safe in stating that certainly the use of the lift process has the tendency to permit of the extraction of a larger percentage of total oil by reason of its ability, through pressure, to retard water encroachment, and its effect of livening the oil by reassociation of gases under pressure.

Progress in Steel Rig Building Great in Last Decade

By J. D. McEwen*

J. D. McEWEN

IT HAS been the history of oil production that oil is found at deeper and deeper levels until today we have extensive drilling campaigns at depths of 6000 feet and more in some areas. These depths, and the ever present race to be first to the "pay," demand constant improvement in the methods, design, and materials of drilling and production equipment.

The boom days of the early Pennsylvania fields are within the memories of only a few "Old-Timers," yet it is only within the past decade that the most rapid progress has been made in drilling equipment. This article will be limited to that portion of surface equipment ordinarily termed the "Rig."

The term "Rig," as hereafter used, will be understood to include the derrick, the derrick base, machinery supports, belt and engine houses, rig irons, bull wheels, band wheels, calf wheels, walking beam, pitman, and in fact, the complete surface equipment with the exception of tools, which are a separate item.

The steel rig of today is greatly improved in design over the steel rig of 10 years ago. These improvements are due jointly to the engineering experience which has been brought into the industry and to the demands for better equipment due to deeper drilling. In the first steel derricks, steel members merely substituted for wooden members, with little effort to make an engineering analysis of stresses, or to consider thoroughly the changes necessary in design when steel was substituted for wood. Thus we find that the bracing of most of the earlier derricks would not permit of a satisfactory stress analysis.

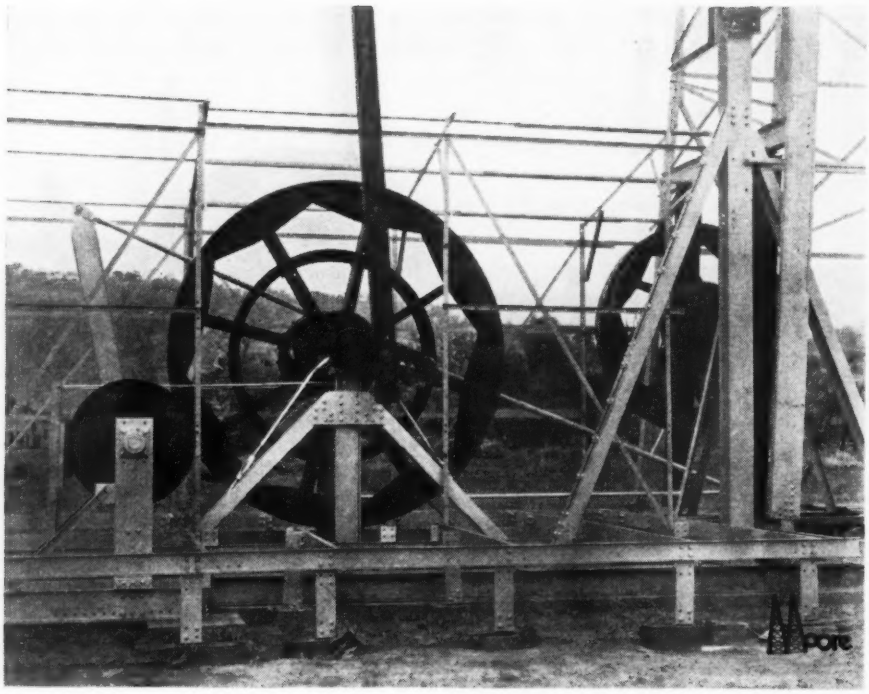
The deficiencies in design of early steel derricks were largely in the bottom bracing. In changing from wood to steel, the most of the pioneers failed to consider the difference in the stiffness of the bottom legs of four to eight planks, and the stiffness of a much smaller steel leg section. Although the steel leg section may have had greater strength for vertical loading, it needed adequate bracing to develop its full strength. It was not uncommon in the early derricks to omit all bracing in the bottom panel. In others, the bracing in bottom panels was copied from the wooden derrick and the stresses were compounded in a manner entirely contrary to good structural design. Fortunately, much heavier members were used than would be required for a good design and this excess weight, together with the comparatively light loading of that period, was ample in most cases for the compounded stresses due to improper design. The producer, however, was penalized with a great deal of excess weight which he was obliged to transport, usually under unfavorable conditions.

As the steel derrick business has advanced, structural engineering has played an increasingly important part in derrick design, until today we have much better derricks than we had only a few years ago and at the same time, much lighter derricks with greater crown block capacities and more rigid bracing, which makes them much more safe under heavy overloads and unfavorable field conditions.

The better steel derricks of today are thoroughly engineered, as are all modern steel structures. They are designed not only for heavy crown block loads, but high wind loads, in addition, and the horizontal loading due to heavy set-backs of drill pipe, casing, or tubing, which must also be held up by the derrick. The design of today's derrick is influenced largely by the specifications of the standardization division of the American Petroleum Institute.

These specifications were drawn up jointly by the engineers of the producing oil companies of the country, and the engineers of the rig manufacturers. Allowable unit stresses

*Chief engineer of the Lee C. Moore Co. Inc., steel derrick manufacturers.



Late type all-steel machinery supports with H-beam main sill running through to nose sill and steel walk supports

are based upon the specifications of the American Institute of Steel Construction, the recognized authority in this country.

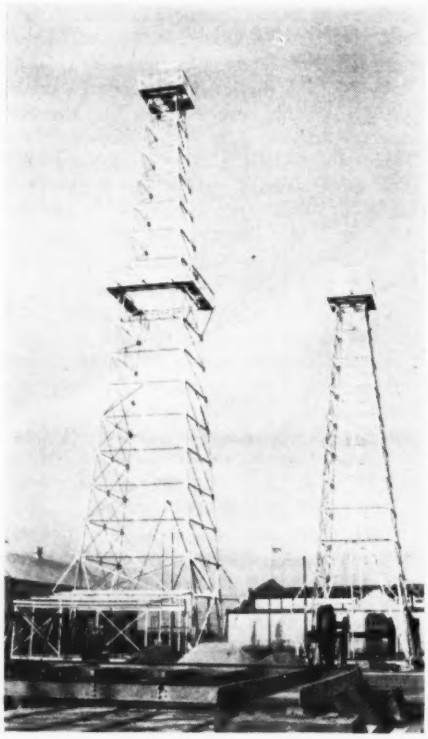
To meet A. P. I. specifications, derricks must be designed to carry all horizontal loading without guy wires. The A. P. I. code of recommended practice, gives the producer specifications for derrick corners adequate to prevent an unguyed derrick overturning under specified conditions. The addition of "wing" braces on the outside of the derrick leg has been one of the most outstanding recent developments in stiffening derricks. On account of the necessary openings for equipment between the floor and first girt it is impossible properly to brace the starting legs on the inside. "Wing" braces have overcome this weakness.

In addition to improved designs, improved materials are also available. One manufacturer furnishes 40-50 carbon A. P. I. seamless steel tubes for leg sections.

There has also been rapid progress in the design of steel machinery supports in the past few years. Steel is rapidly becoming more common for this purpose, and designs have been greatly simplified. What is commonly known as all-steel machinery supports, were originally built up of many channel sections and stiffeners which necessitated many bolts and too much erection time. This type has been greatly simplified in the latest designs by a thorough analysis of the stresses in a drilling rig and the use of H sections. This type of machinery supports can be used on a comparatively inexpensive foundation of either concrete or wood, as the drilling stresses are largely carried within the structure itself, with a minimum of uplift at the rear of the rig. It is especially desirable for wildcat or foreign exploration work.

Where materials for concrete are readily available, the unit type of machinery supports is rapidly gaining favor. In this type the jack posts and samson post are individual units resting directly on concrete but with no steel sub-structure. The uplift of the crank in this type must be reacted by the weight of the concrete foundation. This construction gives a permanent fireproof rig which can be used for drilling-in a well and producing it throughout its life with a minimum of upkeep expense.

Steel bull wheels and calf wheels have almost entirely replaced wood, while steel band wheels, walking beams, pitmans, bull wheel posts and calf wheel posts are just coming into common use.



Combination 122-foot and 80-foot cable tool A.P.I. derricks on display at International Petroleum Exposition

Deep Rock Drills New Test in Andrews

HOUSTON, Oct. 12.—Deep Rock Oil Co., subsidiary of Shaffer Oil & Refining Co., has begun a second test in Andrews county, west Texas, 2310 feet from the north and east lines of block A-46, Public School Lands sec. 20.

The test is about a mile southeast of its No. 1 Harris, in sec. 12, which will be plugged at 4688 feet. A pay topped at 4405 feet in the Harris test produced three and a half bailers of oil daily for the last month, but deeper drilling failed to result in a commercial well.

Shows of heavy black oil were found in the Harris test at 4210-4263 and at 4270 feet, late in July. About 1,000,000 cubic feet of gas daily was drilled through at 2946 feet.

Elevation of the Harris test is 3167 feet above sea level. The top of the lime formation of the Permian salt basin was reached at 4005 feet, or 838 feet below sea level.

Llano Oil Co., which owns a 12,000-acre block southeast of the Deep Rock tests, and adjoining the block of the Shaffer subsidiary, is considering drilling operations.

Most of the adjacent acreage has been under lease a considerable time. The few trades recently made have been at bonus ranges from $5 to $15 an acre.

Oil Buyers To Meet During "Expo"

TULSA—The proper marking of valves and fittings for oil country use will be discussed at the meeting of the Oil Company Buyers' Group of the National Association of Purchasing Agents at Tulsa on Oct. 23, which is during the International Petroleum Exposition. The possibility of standard specifications for valves and fittings will also be discussed, according to H. M. Cosgrove, secretary of the Purchasing Agents' Association of Tulsa.

Emory A. Cook, purchasing agent of the Twin State Oil Co., Tulsa, and chairman of the Group, will preside at the session. A. M. Bowman, general purchasing agent of the Humble Oil & Refining Co., Houston, and president of the National Association of Purchasing Agents, is expected to attend the meeting.

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EMSCO STEEL EQUIPPED WELLS ARE SAFE

Deep Drilling in Appalachian Field Encounters Odd Difficulties

By J. G. Montgomery, Jr.*

DEEP WELL operations in the Appalachian field have been encouraged by the discovery of gas near Richburg, Allegany County, New York. The Belmont Quadrangle Drilling Corp., drilling a test well with the white Medina sand as its objective, recently encountered a flow of about three and a half million cubic feet of gas in the Onondaga Limestone. Drilling has been suspended to utilize the gas.

Six other deep tests have been under way from three to seven years. A brief history of each follows:

The Johnstown Test—The American Research Company started a deep test on Laurel Ridge Anticline in Westmoreland county, Penna., near Johnstown. This operation, which has since been taken over by the Johnstown Gas syndicate, has reached a depth of 6,751 feet. The Johnstown well is remarkable in that with 4,000 feet of open 8-inch hole, the present depth has been reached without drilling difficulties.

The Tidioute Test—On Sept. 6, 1925, the Fidelity Petroleum Corp. of Baltimore spudded its deep test well near Tidioute in Warren county, Penna. The goal of this undertaking is the white Medina sand, which formation will probably be reached with 100 feet of additional drilling. At the present time drilling is progressing in the red Medina sand at a depth of 5,650 feet, with a flow of about 15,000 cubic feet of gas from this horizon.

The following pipe has been used in the hole: 730 feet of 10-inch casing, 4,439 feet of 8¼-inch casing, 340 feet of 6¼-inch liner, 250 feet of 5-inch liner and 80 feet of 5⅜-inch liner.

On Aug. 21, 1927, just as the pay in the red Medina was being encountered, the tools became lodged in the 5-inch liner. For more than a year fishing operations were continued, and finally the lost string of tools has been sidetracked and cased out of the hole with the 5⅜-inch liner. The Tidioute test has been under way for more than three years.

The Big Run Test—In Sept. 1924, F. C. Deemer spudded his deep test well near Big Run in Jefferson county, Penna. Within seven months' time this test had reached a depth of 6,600 feet. At this point considerable caving was experienced, and to combat the difficulty, Mr. Deemer cemented through the cave and redrilled the hole. This process was repeated until at the present time, the hole has reached a depth of 7,286 feet. With but 970 feet of 6¼-inch casing and 6,314 feet of open hole, this test has made a record in length of open hole.

The Big Run test has been under way more than four years, and is at the present time cementing a string of tools in the hole preparatory to sidetracking them at a depth of 7,286 feet.

The Randolph Test—In November, 1921, the Elko Oil & Gas Co. spudded its No. 1 Hotchkiss near Randolph in Cattaraugus Co., New York. This well was started with the purpose of testing the white Medina sand. After two years of intermittent drilling, the red Medina sand was reached at a depth of 4,665 feet. At 20 feet in the sand, a flow of 226,000 cubic feet of gas was encountered, and the tools lost. This hole was given up when a year's fishing proved unsuccessful.

A second hole was spudded, but in floating the 6⅝-inch casing in the hole, the pipe collapsed when the disc valve broke and the hole was plugged. Fishing continued for more than a year before this 4,500 foot hole was abandoned.

On April 30, 1928, the company spudded its third hole in its effort to complete a test to the white Medina. Drilling is progressing in this hole at a depth of 4,150 feet. The Randolph test has been under way almost seven years.

The Kane Test—The United Natural Gas Co. spudded its deep test well on Sept. 21, 1925 in Elk county near Kane, Penna. This test was started with the purpose of testing the white Medina sand, the bottom of which was estimated to be about 7,200 feet below the surface at the well location. With 43 feet of 13-inch drive pipe and 377 feet of 10-inch casing, the 10-inch hole was carried to 4,360 feet where a bit, reamer and bailer were lost. Fishing proved useless, so the rig was moved 45 feet and a new hole spudded.

Now, after three years of drilling,

*Superintendent, United Natural Gas Co., Oil City, Pa.

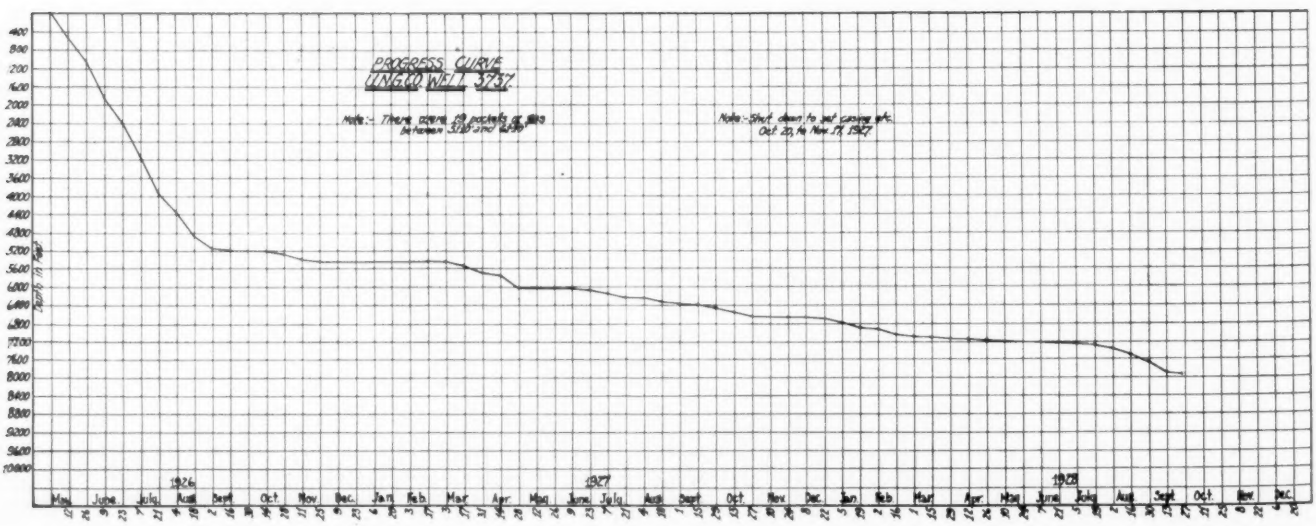

Figure 1

the second hole has reached a point more than a mile and a half deep. It is now shut down at 7,925 feet waiting for a new cable.

In the second hole, several formations gave considerable trouble. The Marcellus shale, at a mile below the surface, hampered progress by its continued caving. This shale and the Onondaga limestone, immediately below, contained numerous gas pockets under high pressure, which, upon being tapped, let go with such force that much damage usually resulted. At times the tools were blown up the hole 200 feet, where they often became wedged, resulting in fishing jobs. Manilla rope crackers were used in drilling through these pockets, and although the crackers were usually ruined, they minimized the damage to the rest of the cable. A total of 20 gas pockets were encountered at intervals of from five to 75 feet apart. Some of the gas flows exhausted in five minutes, while others lasted two hours.

The Salina formation, containing strata of salt and shale of more than 600 feet in thickness, caused much delay when the salt continued to dissolve and allow the shale to fall into the hole. Bridging of the salt caused considerable difficulty.

The red Medina, because of its extreme hardness caused excessive wear on the cable. Very often less than a foot of hole per day was made. This slow progress, along with the damaging gas pockets, has resulted in the use of 83,500 feet of wire line cable to reach the present depth of 7,925 feet. Figure 1, the progress chart, shows the rate of drilling as the hole went down.

A great deal of time has been consumed on this test in fishing for lost drilling equipment. Aside from those experienced in the first hole, 21 major fishing jobs occurred in drilling the second hole to its present depth. A total of more than seven months' drilling time has been consumed in fishing. Among the causes of lost tools, the gas pockets rank first. After encountering a pocket on one occasion, 93 days were spent before the tools were recovered. After cleaning the hole, drilling proceeded only five feet when another pocket was encountered, causing a six weeks' fishing job. On only three occasions was equipment left in the hole. One bit was cemeted in and two bailers drilled up.

At 6,604 feet a record string of 8¼-inch casing, weighing 225,000 pounds was set. The pipe was lowered on the drilling cable in eight sections ranging from 76 to 293 feet, and built up from the bottom. A length of 1,867 feet was set in this manner, and the final section of 4,737 feet was run in the regular manner. Figures 2 and 3 show the type of coupling used to join the several sections together. So

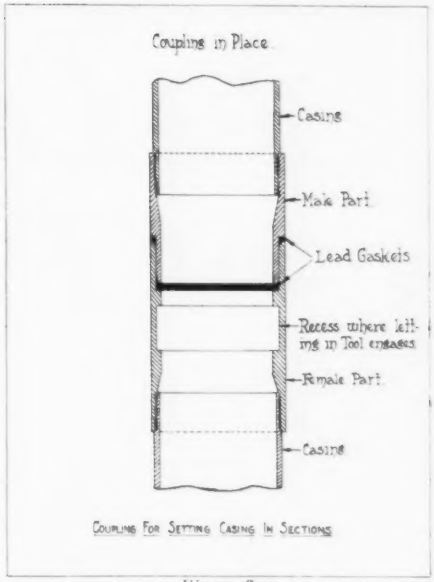

Figure 3

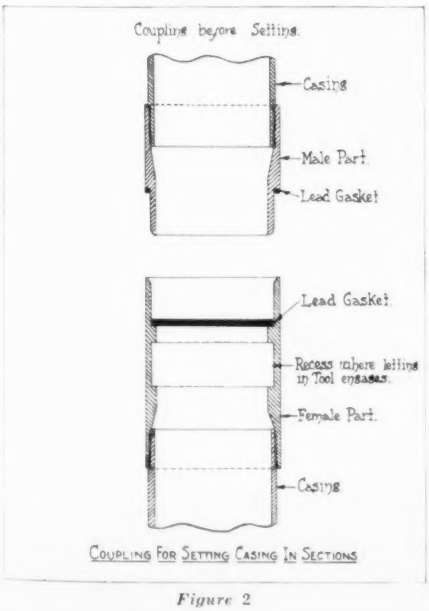

Figure 2

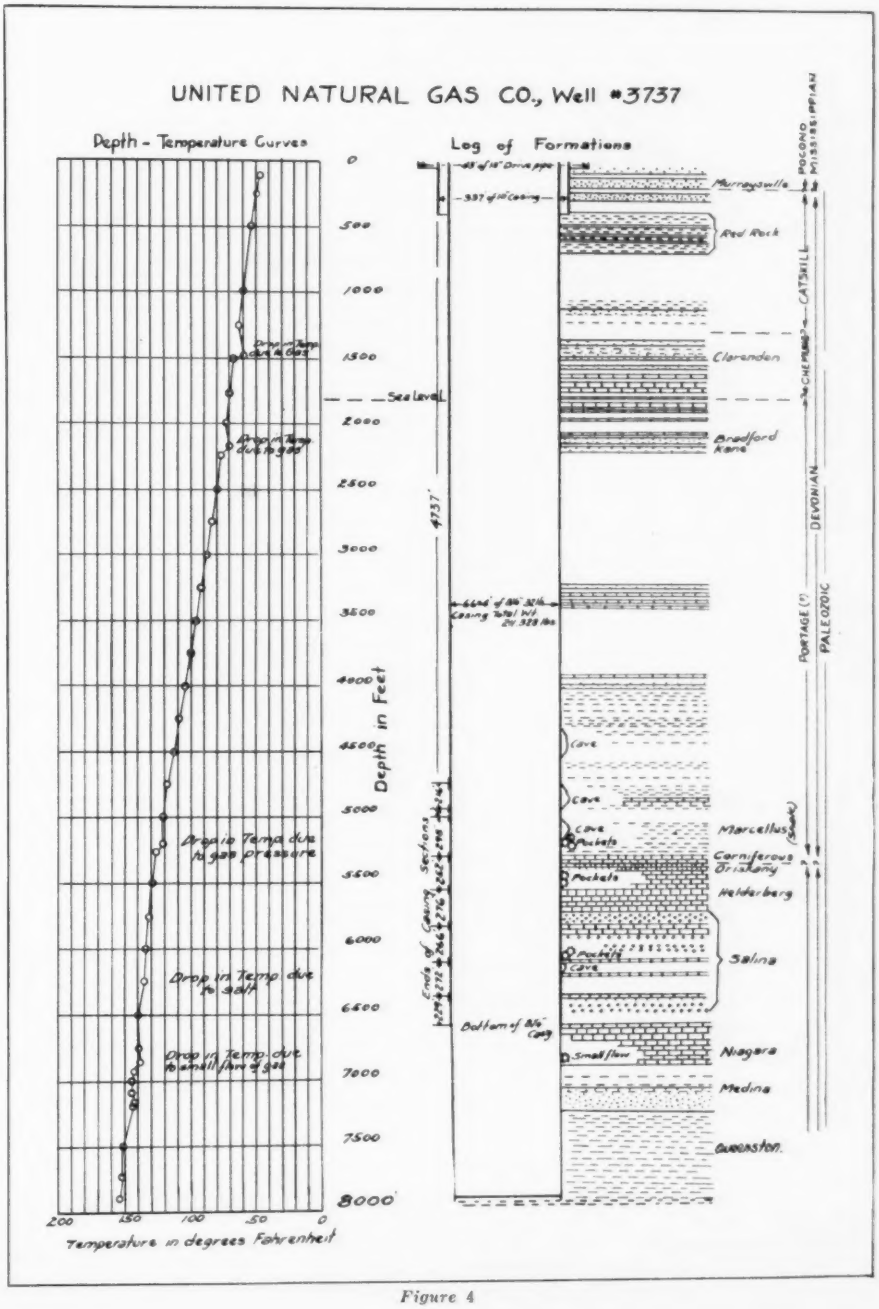

Figure 4

The Latest Achievement of Hughes Engineers

In response to the demand of the oil and sulphur producing industries Hughes Tool Company has developed and perfected a core bit for use with the rotary process of drilling. Two types of cutter heads make possible the coring of formations ranging from the hardest to the softest.

Because of design and heat treatment of the alloy steel parts the Hughes Core Bit is safe, fast and economical in operation. Its simplicity of operation, high percentage core recovery, long life and trouble free operation recommend it for use wherever this tool is required.

The two types of cutter heads are interchangeable, making it necessary to have only one bit body on a drilling well.

In developing this new product the Hughes Tool Company again demonstrates its policy of giving to the industry only such tools as will meet a well defined and economic need in the field.

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far as known, this method has never been used before.

After the white Medina proved unproductive, it was decided to attempt to reach the Oswego sand in the Kane well. The test is at present shut down in the Queenston red shales, waiting for the arrival of a new 10,000-foot tapered cable. Half of the new cable will be 1 inch in diameter, and the other half ⅞-inch.

Figure 4 shows the depth-temperature curve, and also the log of formations encountered. The temperature curve shows the uniformity at which the temperature increases with depth. The highest temperature recorded was 153 degrees Fahrenheit at a depth of 7900 feet. The breaks in the curve show clearly were gas was encountered.

The log chart indicates the position of the casing couplings with respect to the gas pocket cavities and cave formations.

The scientific value of the material and data collected in putting down this test well has made the venture worth while.

A list of some of the difficulties encountered in Appalachian deep drilling and the methods of overcoming them follows:

Caving—The Big Run test has successfully cemented and redrilled caving formations several times. The Tidioute test used liners. The use of jar bailers to prevent hang-ups and the dumping of drilling water is common practice.

Breaking of Pins—Both the Richburg and Kane tests experienced difficulty from the breaking of pins, especially while in the big hole. Larger joints eliminated this difficulty in the Kane well.

Gas Pockets—At Kane the use of manilla crackers minimized the damage to the wire line. The carrying of large diameter holes through this horizon provided more clearance between the walls and the tools thus reducing the disastrous effect.

Fishing Jobs—The large hole aided greatly in overcoming the many fishing jobs at the Kane test.

Wear on Cable and Casing—The lengths of open hole and hard formations cause excessive wear on the cables. Specially lubricated wire lines have reduced this wear both on the cable and on the casing.

Irritating Gases—The Peoples Natural Gas Co.'s deep well in Westmoreland county, Penna., encountered a gas having an irritating effect on the workmen. Gas masks eliminated the effects.

Setting of Long Strings of Casing—By lowering the casing in sections as was done in the Kane test, the dangers are reduced.

Deviation of the Hole from Vertical—By testing the hole with the bottle-acid method, the points of deviation can be determined, and the hole straightened by cementing and redrilling.

Many Factors Have Effect On Compressor Efficiency

By E. W. Jordan*

E. W. JORDAN

SEVERAL fundamental rules must be followed in order to create a highly volumetrically and mechanically efficient compressing unit, such as a highly efficient driving medium. A compressor cylinder properly constructed has efficient heat transference, plenty of effective valve port area, easily operating valves and clearance reduced to a minimum. It also has easy flow of gas to and from the cylinder by way of ample inlet and discharge pipe connections in order to prevent excessive back pressure on the discharge side of the piston, and to reduce excessive vacuum on the intake stroke of the compressor piston.

Generally the man who holds a position of responsibility with a progressive oil company "knows his stuff" thoroughly because, as a rule, he has worked his way up from the bottom with his company. But the best of men "get off on the wrong foot" sometimes and there is one question upon which considerable confusion seems to exist in the minds of non-technical men. That question is, how to get the highest volumetric efficiency of a compressing unit. Here are some rules that a purchaser must observe in order to make effective the refinements and improvements incorporated by the manufacturer:

The best efforts of the manufacturer can be nullified very easily by bad installation and the very best of compressing units compelled to give but mediocre performance.

Be sure that your units are placed on a firm and substantial foundation, well grounded and bolted down.

Do not reduce the size of the inlet and discharge pipes near the compressor cylinders from the sizes indicated by the manufacturer.

See that the gas or air taken in by the compressor cylinder is perfectly clean.

See that the cylinder is properly, but not lavishly, lubricated.

See that efficient and properly proportioned intercoolers are used in all multi-stage compressing work.

If intercoolers are not used in multi-stage work very little is gained in efficiency over single staging for the same ratio of compressing. All the advantage gained would be due solely to the heat transference through the water jackets of the cylinders and the short length of pipe from the discharge of the low pressure cylinder to the intake of the high pressure cylinder.

An allowance of 10 per cent reduction of temperature of compression from this source would be very generous. Let us see how they work out compressing gas .65 specific gravity.

Example No. 1—Single Stage:
14.4 pounds absolute zero
Temperature of incoming gas and atmospheric 75 deg. Fahr.
Pressure, 0 to 125 pounds.
Ratio of/compressions, 9.85
H. P. available, 185 at 190 R. P. M.
Compressor cylinder 67% volumetrically efficient with 2% clearance
Rise of temperature due to compression, 323 deg. Fahr.
Two compressor cylinders, 11½" x 20"
Delivery of free gas, 867,000 cu. ft. per 24 Hrs.

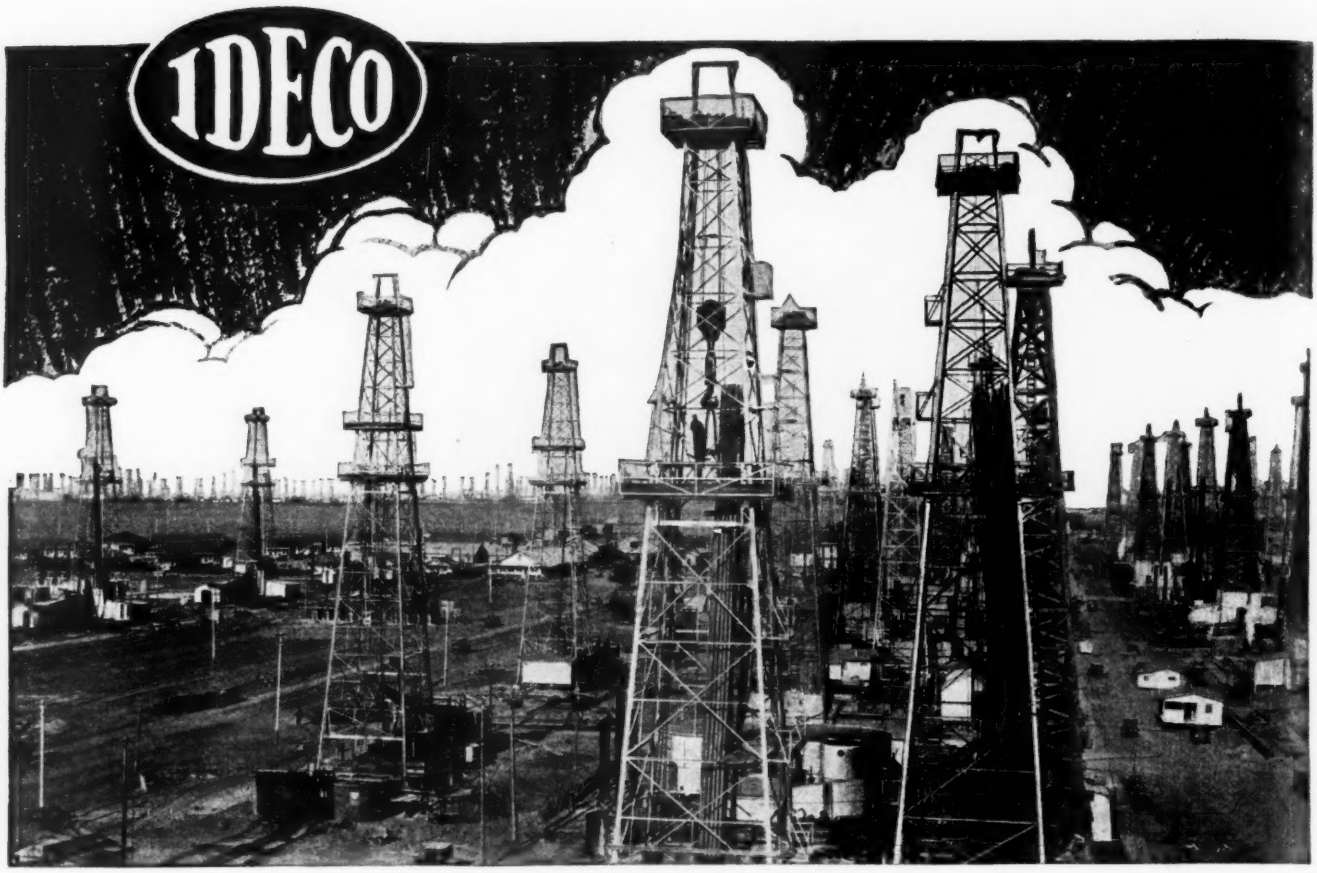
Example No. 2—Two-Stage with intercooler:
All conditions same as above with following exceptions:
Total ratio of compression, 9.85
Ratio for each stage = $\sqrt{9.85} = 3.125$
Low pressure cylinder 2% clearance, 88% Vol. Efficient with intercooler.
Temperature rise of each stage 140 deg. Fahr.
Cylinder sizes 17¼" x 10" x 20"
Delivery of free gas 1,290,000 cu. ft. per 24 Hrs.

This, assuming that an intercooler of sufficient capacity to reduce the temperature of the compressed gas from the low pressure cylinder to normal temperatures, or 75 degrees Fahr.

The results indicate the advantages of multi-staging compressor work over single staging, where efficient intercooling is practiced.

We would draw the line for minimum two-stage compressions at approximately five compressions, likewise for maximum single stage work

*Oil and gas engineer, Bessemer Gas Engine Co., Grove City, Penna.



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at the same number of compressions.

To accentuate still further that advantages of multi-staging compressors with efficient intercooling, I would say, that in the two preceding examples there is a reduction of 17 per cent of power required per unit of gas, as compared with the single stage operation. Also there is the difference between 67 and 88 per cent in the volumetric efficiency in favor of the two-stage unit.

I would like to submit one other example to show why there is small advantage in two-staging without good intercoolers:

Example No. 3—Two-stage without intercoolers: All conditions same as in Example No. 2, with the exception of changed conditions due to lack of intercooler.

Cylinders, 17¼" x 10" x 20"

Temperature of compression, 140 deg. in first cylinder, reduced 10% due to heat transference in cylinder walls and connecting piping.

Temperature at intake of high pressure cylinder would be 140° — 14° + 75° = 201°; whereas in Example No. 2 the temperature would be 75 deg. Fahr., due to intercooling, then as gas expands 1% for each additional 10 deg. Fahr. increase in temperature, the volume of gas delivered to the high pressure cylinder would be increased $\frac{201° - 75°}{10}$ = 12.6%. In other words, the volume of gas would be 12.6% greater between high and low cylinders, due to lack of intercooling. This, in turn, increases the intermediate pressure, increasing the ratio of compressions in the first stage cylinder, and decreasing its volumetric efficiency in direct proportion, making a possible total loss of approximately 15% in the delivery of the compressing unit making the daily delivery 1,096,500 instead of 1,290,000 cu. ft. per day.

These figures, of course, would vary greatly under different pressure conditions and variations of heat transference. The difference in output of gasoline, or gas, would surely pay for a nice intercooling outfit in a very short time.

Winkler Potential Shows Its First Decline

HOUSTON, Oct. 12.—For the first time since the beginning of prorating in Winkler county, west Texas, May 5, the rated daily open flow potential production of the field shows a decline.

Based on one-hour tests of wells, multiplied by 24 to gain daily estimates, the 363 producing wells in the field were credited with total potential of 2,496,491 barrels in the prorating period of Oct. 1 to 15. In the period of Sept. 16 to 30, the potential was rated at 2,505,902 barrels in the prorating yardstick.

Allowable production was cut back from 175,000 barrels to 150,000 barrels daily, effective Oct. 1, on order of the Railroad Commission of Texas, which adopted earlier recommendations of the Winkler county advisory committee of operators.

OAKLAND, Calif.—"Today's Opportunity" is the title of a booklet just published by the S. T. Johnson Co., manufacturer of oil burning equipment.

Thorough Mixture Needed for Efficient Engine Operation

By S. B. Daugherty*

S. B. DAUGHERTY

A STREAM of muddy water from a creek flowing into a river of clear water will remain unmixed, and show a defined line of demarcation for a considerable distance. In exactly the same manner a stream of gas flowing into a stream of air will tend to maintain its identity, particularly at moderate velocities.

This suggests a consideration of observed phenomena in gas engine operation and throws light on some troubles that were difficult to diagnose.

Authorities seem to agree that the best efficiencies are to be obtained with the leaner mixtures. With certain engines, any attempt to cut down on the gas below a certain minimum would immediately start backfiring. It was accepted as an inherent defect, and the gas was adjusted so that backfiring would occur only occasionally. The gas consumption seemed high, but otherwise the operation of the engines was quite satisfactory.

Assuming that the gas and air are not thoroughly mixed, but have entered the cylinder more or less segregated, what results would be expected?

It would seem that in certain areas the mixture would be excellent, in other places too rich, or too lean. This would result in an irregular rate of flame propagation, and it could easily be that some portion of the charge would still be burning at the completion of the exhaust stroke when the inlet valve opens to admit a new charge. This would explain the backfiring.

The regulating valves of the engines mentioned were of the throttling type, one valve admitting gas, the other air. The relation of the incoming streams was very like a small creek flowing into a river.

Now suppose that a reason existed for mixing a stream of muddy water with a river of clear water so that it would be uniformly distributed. What would be the best means? Obviously, to carry the muddy water across the whole width of the clear stream, allowing it to fall into the larger stream through many small openings uniformly distributed.

Exactly this expedient was tried in the case of a gas engine. The results were very gratifying. Backfiring was entirely eliminated. This made it possible to use any mixture ratio desired. Mixtures could be ignited that were so lean that the rate of flame propagation would be slowed down to such an extent that there would be no rise in pressure during the stroke above the initial compression pressure. Such mixtures would ignite regularly, and combustion would apparently be complete before the end of the stroke. With this ability to use any mixture ratio, unhampered by backfiring, adjustment for economy was possible. The indicator cards showed that flame propagation was speeded up. Full advantage could then be taken of expansion. Mean effective pressures were higher. Gas consumption per unit of output was lower.

Experience has demonstrated that for long periods of operation, costs of maintenance are reduced by limiting the load on a gas engine. Stated another way, it is possible to consume a certain amount of gas in a given engine. Any increase results in a higher maintenance cost over a long period due to cylinder fracture from heat stresses, and to valve trouble. If by any means this gas can be used more efficiently, the load on the engine can safely be increased, until the gas consumed has reached

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*Back in 1898 Mr. Daugherty assisted in the design of the first 1000 horsepower gas engine-gas compressors built in this country, at the plant of the National Transit Pump & Machine Co. These engines are still in daily use.

In 1916 he was again in responsible charge of the design of the largest gas engines in this country, i.e., 46 x 66-inch twin tandem, 4500 H.P. double acting engines driving A.C. generators.

Since 1923 he has been more or less of a free-lance designer and consulting engineer, in intimate contact with gas men and their problems.

Mr. Daugherty's most recent work was the designing of the 17 x 24-inch gas engine compressor for the National Transit Pump & Machine Co.

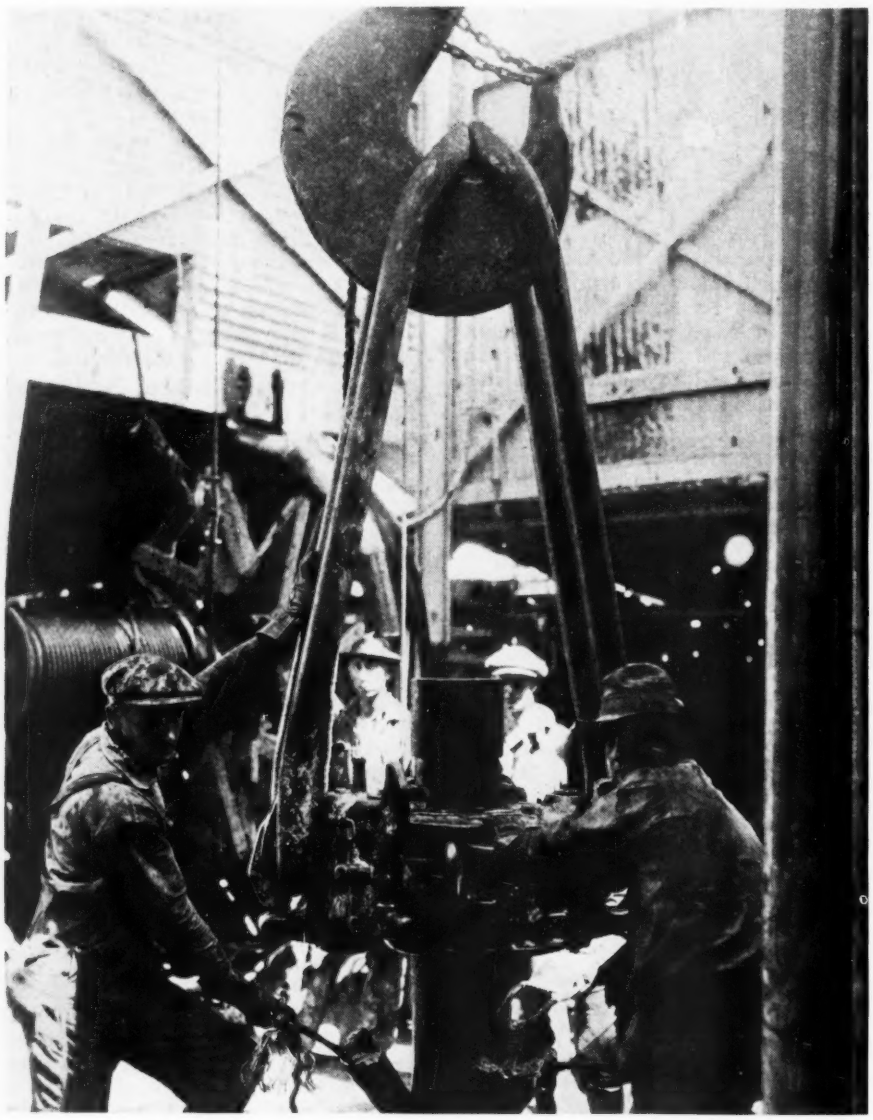
the maximum amount found to be satisfactory. Assume that it has been demonstrated that a certain type of engine can be operated at 375 horsepower and consumes 4500 cubic feet per hour. If the gas consumption can be cut to 11 cubic feet per hour, the load on the engine can be increased to 509 horsepower. In many installations an improvement in efficiency would obviate the necessity of a capital outlay for increased capacity.

This matter of providing efficient means for insuring a homogeneous mixture of gas and air has for many years received but little consideration. Designers, almost without exception, have considered that means for controlling relative volumes of gas and air were all that were needed, trusting to the general turbulence in pipes and passages to mix them. Results prove that more is needed.

Tests seem to demonstrate that approximately 10 per cent in fuel saving can be effected by providing efficient means for mixing the air and gas thoroughly before, or as it enters the engine cylinder on the intake stroke.

OAKLAND, Calif.—"Today's Opportunity" is the title of a booklet just published by the S. T. Johnson Co., manufacturer for over 23 years of oil burning equipment here. The booklet presents many facts on the oil heating industry and shows the profits possible from this business.

Handling Longest String of Casing



The super safety side door type automatic slip grip casing elevator for rotary drilled wells is shown here in use on the No. 1 Hartman well of the Associated Oil Co. at Ventura, Cal., handling the longest and heaviest string of 9-inch casing ever set, it is claimed. The string consists of 6120 feet of 45-pound casing. The elevator is a new product of the Dunn Manufacturing Co., Oxnard, Calif.

Cooper Co. Buys Hope Plant

MT. VERNON, O., Oct. 15.—Due to the increase in its engineering work, the Hope Engineering Co., consulting and contracting engineers in natural gas and manufacturer of gas engines and compressors, has sold its plant here and its products to the C. & G. Cooper Co., engine builders of Mt. Vernon, effective Oct. 1.

The Hope company will now devote its entire time and organization to sales and engineering work, continuing its main office at Mr. Vernon and its branch offices in the various oil and gas fields. It has been in the business for 15 years, according to R. S. Lord, president.

This acquisition of the Hope plant by the Cooper company will give the latter the manufacturing facilities it previously has had to seek outside of Mt. Vernon, according to Stanley E. Johnson of that company.

Both companies will continue to maintain their separate and unallied identities.

Jenkins To Show New Drilling Valve

NEW YORK—The new forged steel drilling valve of Jenkins Bros., 80 White St. here, will be introduced for the first time at the International Petroleum Exposition at Tulsa. This new valve is made of forged steel parts to withstand extremely heavy service and is tested to 3000 pounds.

The features of this new device are that weight has been reduced to facilitate handling, while the mechanical strength has been increased. It can be operated with ease and speed, and it is made in four sizes.

The company's general line of standard, medium and extra heavy bronze and iron valves will be displayed, as well as sheet packing for steam and water service, and Oil-Tite, especially made for the oil industry.

William H. Utz, vice president and director of sales, is among those who expect to attend the exposition.

Changes Name To Identify Product

DALLAS—In order to more closely identify its brand of protective coatings with the company name, the name of the Everlasting Paint & Sales Co., here, has been changed to McEverlast, Inc., with headquarters at Los Angeles. The company makes McEverlast paints for pipe lines and for refinery use. It has district offices at Dallas, of which D. T. Mason is district manager.

NEW HAVEN, Conn.—A. B. Swartz has been appointed purchasing agent on Oct. 1 for the Safety Car Heating & Lighting Co. here, succeeding J. J. Mallay, resigned.

Marketing Section

DESIGN of bulk and service stations, methods of meeting and saving customers, distribution of petroleum products by tank truck, both in city and country districts, all are important phases of the oil marketing business on which the experience of others is helpful.

¶ Also, the unloading of tank cars at bulk stations constitutes a serious fire hazard if proper precautions are not taken in handling the work. In congested districts, a tremendous amount of damage might be done by a fire caused by carelessness in unloading tank cars.

¶ All these subjects are treated in following articles.

¶ Besides these, there is an article also on how to minimize fire hazard at bulk plants and other places where flammable liquids are handled. This is by an expert engineer familiar with oil fires.

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Warehouses at convenient shipping points.

Will Testing of Brakes Be Laid On Our Doorstep?

By Ward K. Halbert
N. P. N. STAFF WRITER

CLEVELAND, Oct. 11

SPEED laws are being relaxed all over the country. Ownership and knowledge of automobiles are so nearly universal in the United States that legislative acts are beginning to reflect that knowledge. By reason of improved roads, speeds are safe that formerly were dangerous provided the motorist has dependable brakes, and the tendency in legislation is to demand good brakes rather than low speeds.

Already Michigan, Pennsylvania and Colorado require motorists to carry some sort of certificate from responsible authority that their brakes are O. K. Moreover in every good sized city, law or no law, traffic conditions make good brakes essential to safety. The result is that a new industry has been born and brake testing machines are becoming numerous.

Is the oil man going to be obliged to assume responsibility for his customers' brakes? Brake testers already are finding their way into super-service stations, privately owned filling stations and garages that sell gasoline and do greasing. They are being used to attract the oil man's customers into other places.

Equipment manufacturers have met the popular demand for brake testers with probably a dozen different machines, varying in price from $500 to $3000. Manufacturers of the cheaper ones have made an effort to develop something that would comply with law, improve the motorists' measure of safety and do it faster and better than the old fashioned road test.

Manufacturers of the more costly ones have apparently tried to do more. Besides helping the motorist to protect his safety and comply with law they have features that protect his pocket book by reducing tire wear, preventing brake band burning and breakage. But if Chicago is to be taken as a sample of what is going on in the brake testing business, the public's confidence in brake testers is being abused.

So far the oil industry has not done any of the work in Chicago and very little elsewhere. Probably the first oil man to buy and use a brake testing machine was S. D. Hastings, head of the Barkhausen Oil Co., Green Bay, Wis. He bought one more than two years ago. It was the first brake tester in Wisconsin and for some time it was a novelty and attracted trade to the oil business.

A garage across the street from a cemetery in Chicago uses the above sign on the sidewalk near the curb where all passers by must read it. It is the Rose Hill Garage at 5650 North Western Avenue

Because the oil man did the brake testing free and no repair work at all, the public had confidence in him. At a garage, a motorist is likely to think the mechanic is trying to frighten him into having his brakes overhauled.

Three men spent a day in Chicago recently to learn a few things about brake testing from the standpoint of the customer. They took a 1927 Buick and visited a few brake testing establishments (like the bear went over the mountain) to see what they could see. The results were interesting:

At the first place a polite young chap spent 15 minutes on the brakes while the car stood on the testing machine and called them good. He put a "Brakes O. K." sticker on the windshield, collected $3 and smiled the party out the door.

A few minutes later the same car, with the sticker scraped off the glass, stood on another tester. The mechanic took one look at the dials and horror came over his face. Poking at the brake linings with a screw driver he declared the car was dangerous to use but could not be improved without new linings which would be $26.

At the third place the man in charge was asked to examine the brake linings and he said they were in good shape. But he found the brakes adjusted wrong and worked on them again, making a charge of $3. He did most of the testing by the old-fashioned hand method, however, using the tester only to show what a good job he had done.

At the fourth establishment the garageman found two wheels entirely out of harmony with the other two and adjusted them to his own liking, demonstrating with his machine that he had improved them. He also said the brake linings were good.

The fifth place was rushed with business. The Buick was put on the brake tester but the machine was used only for a rack. Two men started working on the brakes without even making a dial reading. When the driver suggested that he believed his brakes were all right, having been worked on recently, the men quit work and pronounced the brakes "O. K." and made no charge.

This account is not an indictment of brake testing machines. The people who make them have attacked an intricate, scientific problem. They have gone at it in different ways. Almost every job shows that thought and skill have been used in their construction.

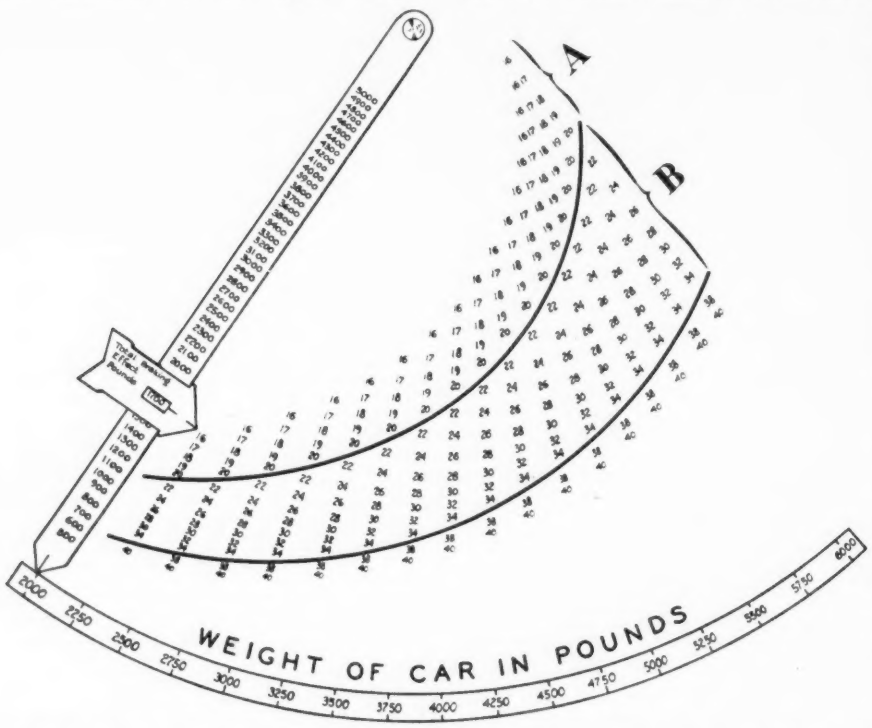
The sad truth is that a great many of these machines are being used for "salesmen." Either law or necessity, in every city and good-sized town, is making people wonder if their brakes are in good order. After this question enters a man's head he will drive on the next scientific brake tester he sees to learn the truth.

The testing job is free, as a rule, so he goes in hoping to find his brakes as good as he thinks they are. That seldom happens. Most often the report he gets is bad. The motorist himself can't tell. He has to accept the report as the attendant reads it off the dials.

The dials on most machines are positively mysterious. The writer inquired of five men, who make a business of testing brakes, what the fig-

ures on the dials might mean. Three of them confessed they did not know and the other two said the figures represented pounds, but they were not quite sure "pounds of what." As far as they knew the dials might have recorded pounds of gas pressure or pounds sterling.

It is hard to find an impartial judge of brake testers. The industry is so new that most men who know much about it are in the business with prejudices and allegiances of their own. The nearest thing to an impartial criterion found so far is the laboratory of the Ajax Rubber Co., in Racine, Wis. That institution is making a thorough investigation of brake testers with the idea of recommending one of them to their dealers.



With the above diagram, operators of safety brake testers interpret dial readings in terms any motorist can understand. First, turn the long arrow until its point indicates the weight of the automobile. Second, slip the short arrow along until its point indicates the number of feet you wish to stop in, safely without burning your brakes. Third, the figure in the slot will show how many pounds of brake pressure must be distributed among your brakes. Figures in group "A" are for cars with four-wheel brakes. Those in Group "B" are for cars with two-wheel brakes

So far they have not found one they are willing to recommend without qualification, but that is not saying they are bad. In fact the laboratory authorities were eloquent in pointing out the good features of all of them. A tire company requires a great deal more of a brake tester than is necessary merely in the interest of safety. The tire man's main thought is to minimize tire wear.

Ajax Tire Co.'s interest in the matter is dual. First they want to overcome damage claims on false charges that certain tires were defective, and they want to build confidence in their product by giving it a fair chance to exhibit uniformity. So they have established in Racine what they call "Dealers' Model Protective Service Station."

The establishment is in charge of W. W. Dimmick, an engineer with long experience in automobile brakes. He says that probably 80 per cent of unnecessary tire wear is due to wheels being out of alignment, and the remaining 20 per cent attributable to eccentric (out of round) brakes.

It is fair to mention Mr. Dimmick and his laboratory in this connection because he has tested a great many brake testing machines, and has given each one a great deal of study. He has not, however, tested them all. He has confined his investigations mostly to the less expensive ones.

Surveys recently made in New York, Tennessee, Maryland and Massachusetts confirm Mr. Dimmick's figures. They showed that 30 per cent of all operating automobiles need brake adjustments to protect the driver's safety, and 9 per cent have brakes so poor that they would be unable to come to a stop from 30 miles an hour, in less than 150 or 200 feet.

If these figures are anything like right, there is a crying need in the country for scientific brake testing. Those who have gone into the business have proven that a popular demand exists. Moreover the tendency in legislation is to make periodical brake tests mandatory. Men who have ventured into brake testing and repairing say it is profitable.

Peter Koppenberger, a Chicago garageman, recently installed a $500 brake tester in his garage and spent about $50 advertising it. He has since put about 25 cars a day on the tester and his additional income the first month from that department was $300. He says his only additional expense was a $4 increase in his electric light bill.

Of course Mr. Koppenberger did the work himself. He and his partner in business were not obliged to employ any more help to do the brake work. Other business men might not be so fortunately situated. However, Mr. Dimmick of Racine, and other experienced men, say a $25 or $30 a week man can do the work perfectly well.

"A polite young fellow, such as is often found at a gasoline service station, is salesman enough to sell brake testing service. An ordinary garage mechanic can do all the work necessary in adjusting or relining brakes," Mr. Dimmick says. "The technical work ought to be done by the machine itself."

Brake testing alone is not always profitable. That was demonstrated by the experiment of S. D. Hastings in Green Bay. It was a free service and if a test proved that a customer's brakes needed repair work he directed them to a garage—preferably one of his own customers. He says the machine brought some patronage but he does not know how much, and that the novelty interest it had at first soon wore off.

"I do not believe an oil man can make any money out of a brake tester, unless he is situated in a big city where his customers are constantly aware of their need for good brakes, until state and municipal authorities begin to enforce a brake law. Then the service will not depend on novelty interest for its value to the motorists," Mr. Hastings says.

Brake testers adapt themselves well for use in a super-service station where they may be operated for profit in conjunction with a brake repair shop and possibly with a wheel alignment service. They do not occupy much space. Any kind of a brake tester can be installed in a compartment big enough to house a two-car greasing pit. Most of them occupy even less space.

After the brake tester is bought there is little more investment necessary. A riveting machine to put linings in brake bands can be had for $60. All the other necessary tools for a small shop would cost less than $40. So the total investment is less than $100 over and above the brake tester.

Of course a brake repair shop has to carry some stock. The bigger the town the smaller the necessary stock. In an isolated place a brake repair shop ought to have $100 to $150 worth of brake lining on hand, but $50 worth is enough in a town of 50,000 population where quick replenishment is possible.

The work in a brake repair shop is done on a basis that amounts to 100 per cent gross spread. Labor necessary to reline brakes costs about $1 a wheel or $4 for a late model

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This mounting makes S-H-S tanks absolutely independent of Chassis twists and strains, and assures perfect fit on any chassis. No cradle.

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Snug, low mounting eliminates side sway, makes greater speed safe, gives driver clearer rear vision.

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The walls of the tank, being made of a single sheet of steel, give the utmost rigidity and strength, and perfectly smooth, neat surfaces.

Extra Large Valves
These extra large valves, opening into 3" seamless steel tubing (all enclosed), make possible much faster unloading. No leaks and no piping troubles.

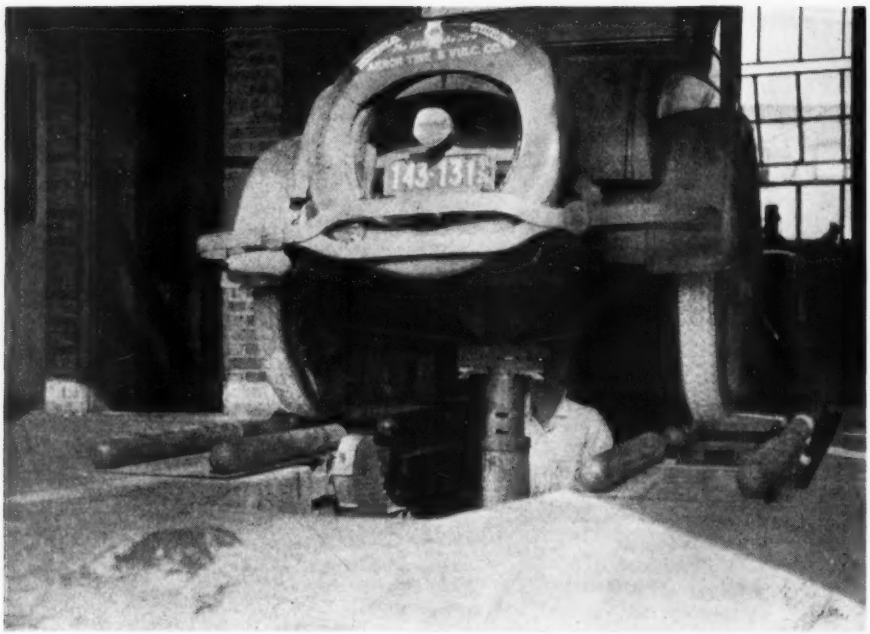
Heater Compartment
This S-H-S patent is the only 100% efficient heater yet invented for truck tanks. It will boil oil, yet by means of a simple control valve it will maintain the right temperature for any weather or climate.

Power Pump Meter and Hose Reel
This S-H-S unit is the latest improvement in oil delivery equipment. It saves oil, time, labor.

Beauty
The graceful lines and smooth surfaces give S-H-S Tanks a beauty in form, and areas for advertisements not found on any other truck tank.

S-H-S TANKS

S-H-S Truck Tanks are Delivered Complete, Including Pumps, Piping, Heater, Insulation, Meter, Hose Reel, Mounting, Painting, Lettering, etc.



Close-up of a brake meter, price $3000, showing workman in the pit under the car. He has just raised the back end of the car off the testing drums to work on the brake bands. Lifts are made with a fast air pressure jack

car. The time and material together will cost about $12, and the price to the customer is usually about $25.

It is a common theory that the number of feet required to stop an automobile should be counted by its rate of speed in miles per hour. In other words, any car running 20 miles an hour ought to stop easily in 20 feet; at 30 miles it should stop in 30 feet, and at 40 miles in 40 feet. The rule is not considered minutely accurate but good for rough-and-tumble figuring.

One manufacturer of brake testers has gone a long way to build a dial that will satisfy his customers' patrons. The Safety Brake Tester has a scale to compute road pull in terms of linear feet, and any motorist with a grammar school education can read it and understand it. Others may be just as accurate but some of them are much harder to read.

The above mentioned scale is reproduced here with a brief explanation of how it works.

In Chicago there are more Cowdrey brake testers than any other kind. In using a Cowdrey, the automobile is anchored on top of the machine, the wheels in contact with metal drums. The automobile is thrown out of gear and the drums are set in motion with electric motors, causing the wheels of the car to run idly on them. When the automobile brake is applied it brings resistance against the drums and that energy is transmitted to the beam of a scale and literally weighed in pounds.

Also there are several Taylor brake testers in Chicago. The Taylor is a liquid pressure proposition. There are four little platforms installed flush with the drive way of the garage or service station, and tests are made by the simple process of driving on these platforms (one wheel on top of each platform) and applying the brakes.

The tires of the automobile take hold of the platforms when the brakes are applied and as the car comes to a stop the four platforms slip forward on rollers. This performance throws four little pistons into play and these pistons force liquid through tubes and the pressure is recorded on dials. Theoretically, the wheel that is least effective in braking has the lowest reading on the dials and the one most effective has the highest reading.

Another mechanical tester that employs the liquid pressure principle is the Jumbo. However, it is entirely a different looking machine from the Taylor. In appearance it more resembles a Cowdrey.

In using a Jumbo the automobile is anchored in place on top of it, with the tires in contact with metal drums. The automobile is thrown out of gear and the drums set in motion with electric motors. When the automobile brakes are applied it brings resistance against the drums and the energy is transmitted to a piston which forces liquid through a tube and makes a record on dials which is read in pounds.

There are a few Raybestos brake testers in Chicago. They employ air pressure in such a way so as to make the spectator understand the relative braking efficiency of his four wheels. In using it the automobile is anchored on an elevated steel rack but each wheel rests on a different movable platform.

Before the test begins the automobile brake lever is clamped down so the brakes will stay on, at constant pressure. Then the movable platforms are pushed back and forth under the wheels by air pressure. The platform under the wheel with the poorest brake moves first, the air pressure being equal against all four platforms. If the movement of the platforms show all brakes to be about equal in effectiveness, then dial readings are made to learn whether the total braking power of the automobile is sufficient. Air pressure operates the dials.

There are several installations of brake testers in Chicago called Brake Meters. They are among the more expensive machines in the service costing about $3000 installed, and introduce entirely another medium of computing brake efficiency. The Brake Meter measures electric current and records the result on a dial.

The Brake Meter is installed in a pit. The customer's car goes on it as it would go on a regular drain pit, but the automobile wheels are made to rest on metal drums, just as they do in the case of the Cowdrey and the Jumbo. And in a similar way, with the car out of gear the wheels idle on drums propelled by electric motors.

There is no scale beam or hydraulic pressure contrivance however. When the driver applies his brakes it brings resistance against the revolving drums. This has the same effect as "cutting in resistance" on the electric current that motivates the drums. This resistance is measured with an electric meter installed on the power wires, and is thus recorded on dials, each wheel separately.

One of the most talked-about brake testers in common use is the Brakes Synchrometer. It also is an expensive machine, costing nearly $2000, and is peculiar in that it employs no power whatever except that generated by the motor of the automobile being tested. The customer provides his own power.

The Synchrometer is simplest of all. It consists of an elevated track which an automobile may reach, via a ramp. In the track are four metal drums and attached to each drum is a heavy steel fly-wheel. All fly-wheels are geared together but may be thrown out of gear and permitted to revolve independently, simply by moving a lever.

When the automobile stands on the elevated tracks, it is anchored with its tires resting on the drums. The motorist operates his car as if it were on the road. When his speedometer says 25 or 35 miles an hour (whatever his habitual speed may happen to be) he applies his brakes, and releases his gear. By the same motion all four fly-wheels are thrown out of gear and permitted to run with no resistance other than that of the automobile's brakes, and each brake is tested separately.

If one wheel has a particularly effective brake, it overcomes the mo-

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Airplanes are coming into wide use in the Oil Industry. Producers and contractors are using them to keep in touch with widely scattered operations. Field superintendents are employing them for emergency delivery of machinery parts, fishing tools, etc. Engineers, well shooters and other specialists are finding them far superior to other modes of oil field travel. Geologists are using them for aerial observation and photography, pipe line departments for pipe line surveys, oil company executives for rapid inspection tours.

Serviceable, dependable, durable, *safe*—SPARTAN merits the attention of the modern oil man whose time is valuable. We extend a cordial invitation to visit our Exposition exhibit, where our latest model SPARTAN, our Walter Engine, and a number of models showing details of construction are on display. We also suggest a visit to our new, modern plant—one of the finest airplane factories in the world—during your stay in Tulsa.

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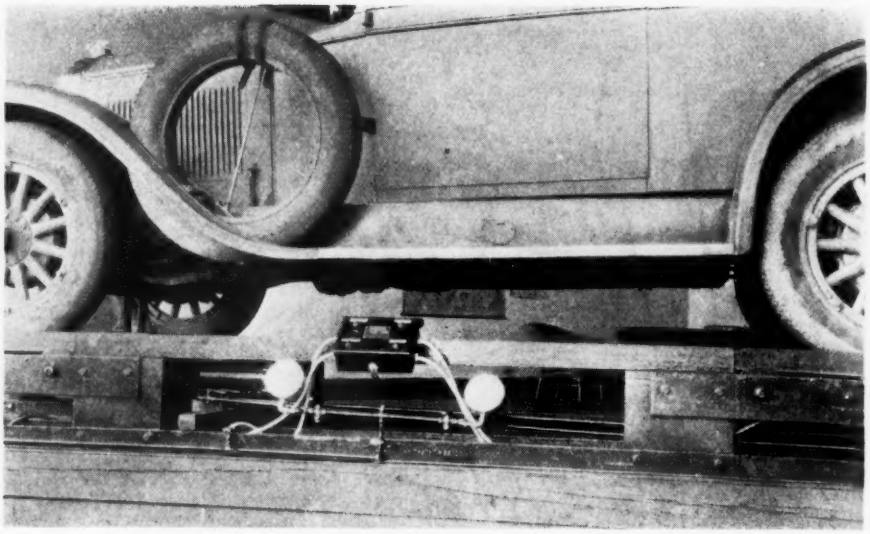

This is an intimate view of a Raybestos brake tester, price $500. Car is anchored, brakes set, and platforms pushed back and forth under the wheels by air pressure. Dials indicate energy used

mentum of the fly-wheel almost instantly. If the brake is poor on one wheel the fly-wheel may run along for several revolutions without stopping. The dials on the Synchrometer are speedometers. They show in the case of each wheel, how far it runs after the brakes are applied.

This does not exhaust the list of brake testers by any means, but it is sufficient to show that all the manufacturers are getting at the same thing in different ways. Some have tried to develop a machine for minutely accurate results, regardless of price. Others have developed machines, in pocket-book range of the garage trade to meet the immediate need.

Box Type Cases

Attractive and serviceable cases of black cobra grain Keratol and lined with red velveteen. Comfortable handle. Plain bottles in separate compartments.

No. 260—Contains twelve 2-oz. long bottles and five ¼-oz. tall grease jars..... **$3.20**

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10% discount for Cash

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Along the Air Lanes

Martin Jensen who piloted the Aloha and finished second in the Dole trans-Pacific flight last year is now on a "barnstorming" tour of the country advertising Veedol motor oil and Tydol gasoline in the interest of Tide Water Oil Co., using their products exclusively.

He spends two or three days in each town on his route, takes passengers up for a fee of $5, using the same plane he used on the Dole flight. He gives each passenger a souvenir log book of the Pacific flight, personally autographed, testifying that the recipient of the book flew in the original Aloha. The book carries Jensen's personal endorsement of Veedol.

* * *

McCamant Higgins, proprietor of the Higgins Service Station at Galax, Va., is the first to have an airplane at Galax. Mr. Higgins returned from a trip to Memphis, Tenn. the first of October in this plane, which he flew himself. He is a licensed pilot and will use the plane for pleasure. It is equipped with Curtiss motor, is of Waco design and is 90 horsepower.

* * *

One of the latest aviation recruits among oil men is G. French, manager of the lubricating department of the Sinclair Refining Co., New York City. On his latest trip into New England territory, Mr. French flew from New York to Boston in a Fairchild plane, making the trip in 1 hour, 50 minutes.

* * *

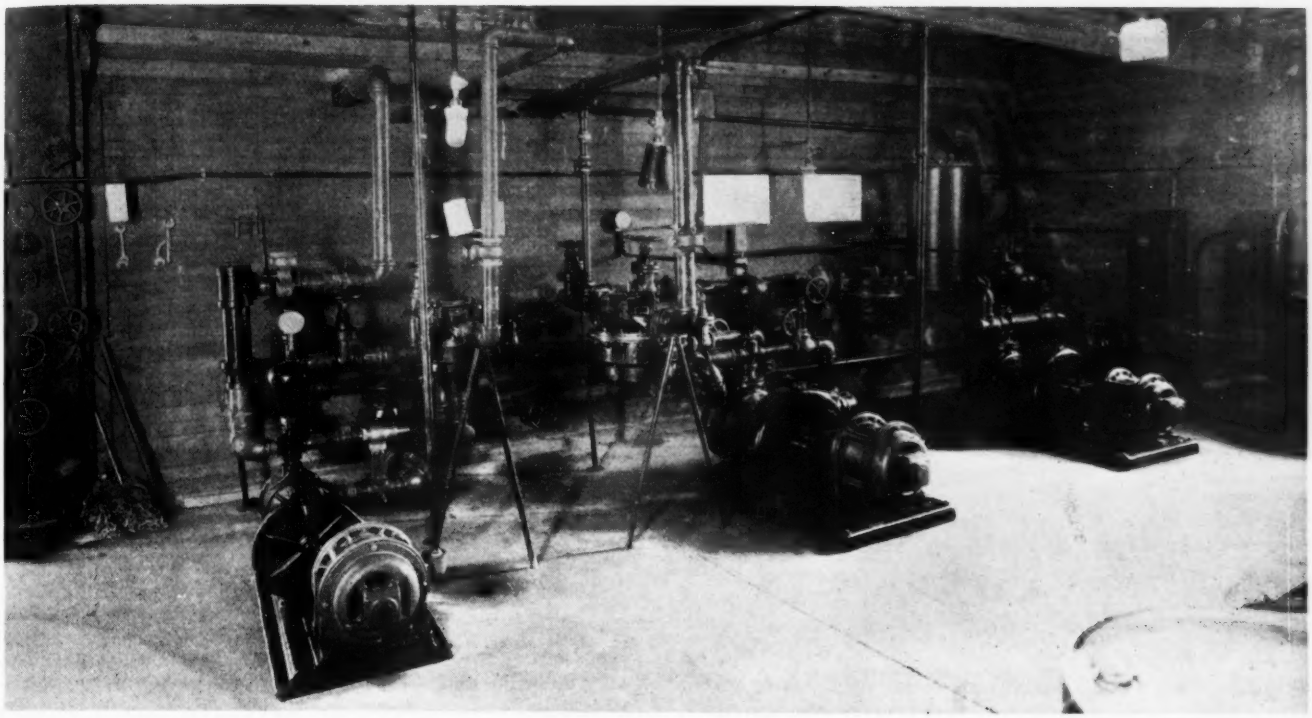
Capt. S. S. Chaderton, Standard Oil Co. of California aviation department manager, recently flew the company's plane from San Francisco to the dedication services at the Walla Walla, airport in Washington. Several days were spent at Walla Walla giving rides to prominent citizens who had never been up before.

* * *

W. L. Stewart, Jr., director, and C. F. Kienesch, manager of technical relations, Union Oil Co. of California, made a two-day trip to San Diego. They left Los Angeles Oct. 1 in one of the Union planes.

* * *

Frank T. Pickrell, vice president and general manager of the Texon-Group 1 companies, spent the week in the west Texas fields, flying from his Fort Worth offices in his new Ryan monoplane with Wright Whirlwind motors.



Interior view of Dick Tyler's pump house. The pump to the right is for unloading gasoline tank cars, the center pump is for transferring gasoline from storage tank to tank, and the pump to the left is for kerosene. The photograph shows the good housekeeping which makes fire insurance on this building less than when it was a cold storage for a brewery

Speed and Accuracy Pay Dick Tyler

By E. L. Barringer
N. P. N. STAFF WRITER

CONNEAUT, O., Oct. 15

SPEED and accuracy—these elements have always thrilled man, but, when applied to a bulk plant, the thrill extends to the region of the pocket book. For these elements do much to insure a profit at the heart of a marketing business.

Both of these factors have been incorporated in the bulk plant of Dick Tyler, Conneaut, O.

On the side of accuracy there is a record of last July when 65,000 gallons of gasoline passed through the plant, and meter and office records jibed within two gallons.

On the side of speed there is the unloading of 8,000-gallon tank cars of gasoline in 45 minutes under normal circumstances.

Such results were obtained by the installation of a metering system and by using all three-inch suction and discharge lines as well as three-inch Bowser pumps; and by gravity for loading tank trucks.

Good housekeeping at Dick Tyler's plant, which goes hand in hand with his efficient layout and operation, has had a material effect in reducing insurance rates. The pump house building now has a lower fire rate than in the days of old when the place was a cold storage for a brewery.

There is a two-car siding at the plant. The unloading rack is of three-inch pipe. A Ford automobile jack placed on the car dome holds the top of the rack in place, and for low tank cars the base of the jack is built up with brick.

A special aluminum length of 3-inch suction pipe extends to the bottom of the tank cars. The light weight of the pipe permits easy handling. The pipe is slotted, allowing it to rest on the tank bottom and still effect complete drainage of the car. After much searching the suction pipe was found in a Chicago warehouse. Dampened burlap sacks are handy for covering the opening in the dome to prevent sparks falling in from passing railroad engines.

There are two pumping units for gasoline and one for kerosene. One pump takes the gasoline from tank car to storage, the other transfers the gasoline from tank to tank.

All gasoline passes through a Bowser Xacto metering system before going to storage. Gasoline also is metered on the line to the tank truck loading rack.

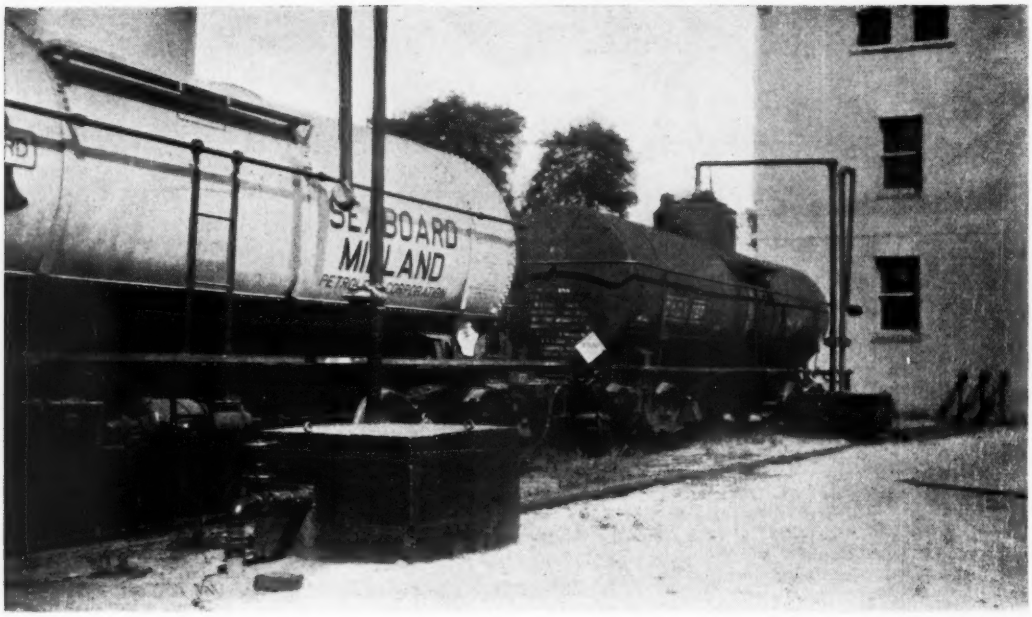
Temperature of the gasoline is recorded at each 1000 gallons during unloading. The thermometer is in a kerosene bath between the pump and the meter.

The pumps and meters were purchased from S. F. Bowser & Co., and the motors from General Electric Co. There are 10 horsepower motors on the gasoline pumps and a five horsepower motor on the kerosene unit. There are three switches of the compensating type which shut off the current automatically on an overload.

Adjoining the pump house is a diked rectangular area for the storage tanks, four horizontal and two vertical. Competitive grade gasoline is stored in one 30,000-gallon vertical tank, and two 16,000-gallon tanks. One 14,000-gallon horizontal tank is used for storing kerosene. One 14,000-gallon horizontal is used for ethyl gasoline and a 30,000-gallon vertical for furnace oil.

Lines have been arranged so transfers can be made between any and all tanks. Valves in the pump house and yard are numbered and on the inside wall of the pump house are instructions in large letters giving detailed information for turning valves in filling or emptying tanks.

The 30,000-gallon gasoline tank has been piped for mixing an absorption blend for winter consumption. U. S. Motor grade is pumped into the tank. The absorption grade is forced through the U. S. Motor by a "spider" arrangement. On the tank bottom is a network of 3-inch perforated pipe. The 40 holes have an area slightly less than a cross section of the three-inch pipe, forcing the absorption



The unloading rack at Dick Tyler's bulk plant. The car to the right is being unloaded. Note the automobile jack holding the top of the rack built up with brick for the low car

through the U. S. Motor gasoline. Quality of this blend is watched carefully for varied weather conditions.

The top half of the blend can be drawn off through a three-inch pipe on a swing joint at the bottom inlet and recirculated. This length can be raised to the middle of the tank by a wire at the manhole. In case the blend begins to stratify the pipe is raised and the blend recirculated again through the "spider." It has been necessary to recirculate the gasoline, however, and a mixture blended with this arrangement will remain a perfect blend for over two weeks.

To the rear of the storage area is a garage for tank trucks and an underground tank for storage of absorption gasoline.

Oil, tires and other accessories are stored in the pump room. The pump house also has a store room for pumps and fittings and a laboratory. Fittings are purchased at wholesale and a complete stock is always on hand.

Before a tank car is unloaded, gravity and distillation tests are run in the laboratory. The car is gauged and outages settled before unloading. The reliability of the laboratory has been checked by refinery representatives and has never been found wanting.

The pumping units were changed recently. Installation was by Bowser, and Hal B. Tyler, son of Dick Tyler, supervised the plumbing. The young Mr. Tyler is a civil engineer and four years ago returned to this country from Costa Rica on account of malarial fever.

Above ground galvanized pipe was used and Byers iron pipe underground. All pipe is 3 inches with the exception of the 2½-inch Ethyl lines. The plant is being standardized on Lunkenheimer valves.

The horizontal tanks were raised recently to get better drainage by gravity flow.

Tank trucks are loaded from the rack between the pump house and the storage area. Loading is done at about 60 gallons a minute from a comparatively full tank and at about 40 gallons a minute from a low tank.

Two trucks were purchased last spring, a 1200-gallon Mack and a Graham Brother truck of 650 gallons. A Ford truck has been ordered. These new trucks replace the old equipment of one Mack, one Reo Speed Wagon and one small Ford truck. In addition to the kerosene, gasoline and oil customers in and around Conneaut, Mr. Tyler handles domestic heating oil in the city and in Jefferson, O., and Girard, Penna.

Each year all the equipment is painted. Gasoline lines are painted red, kerosene green, and valves black.

The pump house building, storage tanks and warehouse of Dick Tyler. In the center rear is the railroad siding. The tank labeled "alcohol tank underground" in the lower left hand corner is used now for storing absorption gasoline

The storage and truck tanks are painted aluminum, the aluminum bronze being purchased in 50-pound lots and mixed at the plant. A gifted service station attendant touches up all the signs each year.

In addition to the bulk plant serving the three trucks, two service stations are supplied with competitive grade of gasoline by gravity flow,* through pipe lines. The longest one is about 1000 feet. There is a 1¼-inch Bowser Xacto meter on each line serving these two stations. This makes a complete meter check on all gasoline drawn from the bulk tanks.

*National Petroleum News, Sept. 19, 1928, page 86.

New Pump, Floodlight Offered Marketers

SHARPSVILLE, Pa. — Two new products for oil marketing trade recently placed on the market by Sharpsville Boiler Works Co., with headquarters here, are the Sharmeter and Sharlite.

The Sharmeter 750 series is a new model, low priced, gasoline pump, electrically driven for operation by either direct drive or remote control. It embodies economy, efficiency and speed in dispensing service. Units for operation by air pressure or by gravity can also be furnished.

Dominating light to attract trade is the purpose of Sharlite, the new floodlight for service stations. It is of special elliptical shape that radiates a direct and diffused light over a large area. It is adjustable to any angle by means of a steel bracket. A special introductory price is offered on this new device.

New Pump Safe Against Fires

ROCKFORD, Ill.—The danger of fire and explosion in the transfer of volatile liquids is said to be prevented with the new hand transfer pump which the George D. Roper Corp. here has just placed on the market. The pump is said to be vapor-proof, fireproof and explosion-proof. Such parts as come into contact with the liquids being transferred are non-ferrous, non-static and non-corrosive. A fire can be built around this pumping outfit, the company claims, without fear of explosion.

Erie Meter Has House Organ

ERIE, Pa.—The "Erie Meter Dial" is the name of a new house organ published by Erie Meter Systems, Inc., here, manufacturer of that system of gasoline dispensing equipment.

The first page is illustrated with its double dialed meter pump, accompanied by an announcement of lower prices on its Commander type. Most of the booklet is devoted to a description and illustration of its meter pumps. It also includes timely news.

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OTTAWA LIFT

A powerful hydraulic lift, oil supported, rotating. This lift operates from your regular air compressor, requiring no pumps or other expensive special equipment. Only one moving part—nothing to wear out or get out of order.

The air used is not wasted but is available for use in spray or grease-gun. Lift is easily installed at low cost from blueprint and instructions furnished. Made in both drive-on and free wheel types. Prompt shipment of either type.

Write for descriptive bulletin with full information, also description and prices of Ottawa Gasoline Pumps, Air Compressors and Air Stands.

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GRANBERG PETROLEUM METERS

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We have made a technical and practical study of the problem of accurately measuring petroleum oils and are prepared to give expert advice and assistance on the subject.

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79 New Montgomery St. **San Francisco, Calif.**

Methods for Reducing Fire Hazards At Marketing Plants

By W. J. Stevenson*

1. **Smoking.** The danger of smoking either on vehicles or on the premises is obvious. Needless to say the "No Smoking" rule should be rigidly enforced.

Signs should be posted at conspicuous places throughout the plant. Our experience has shown that it is the management rather than the employes who disregard this rule.

2. **Loading tank trucks in enclosed buildings with motors running.** A number of disastrous fires have been caused by this practice. An accompanying illustration shows forcibly one result of ignoring this rule. Tank trucks should not be loaded in enclosed buildings when this method is absolutely necessary, the motor should be stopped for at least 5 minutes before starting to load, and all doors and windows kept open to insure a free circulation of air to eliminate the explosive mixtures.

3. **Spontaneous combustion caused by improper disposal of waste.** The majority of oil jobbers handle both vegetable and animal oil, in addition to petroleum products. Improper handling of these oils has resulted in a number of disastrous fires from spontaneous combustion. These fires originated from improper disposal of oily rags, waste, using sawdust as an absorbent, and rubbish. If metal containers are provided and emptied at regular intervals, this hazard can be eliminated.

In warehouses where sawdust is used as an absorbent, all spills should be cleaned up at once and not piled in corners, as a number of our inspections have shown.

Spontaneous combustion may be explained as the ignition of a body by the internal development of heat without the action of an external agent. It frequently takes place in oily waste or heaps of rags, wood, paper and sawdust soaked with animal or vegetable oil. In these cases it is caused by the rapid spontaneous oxidation of oil, which raises the temperature sufficiently to make it burst into flames.

4. **Static electricity.** A large percentage of fires caused by static electricity have occurred when tank trucks were being loaded. One fire resulted in the death of a driver, who was standing on top of the tank while it was being filled, and lifted the nozzle of the filling line slightly while gasoline was still flowing. The static electricity present arched between nozzle and tank and ignited gasoline.

Bulk plant of the International Oil Co., Minot, N. D., going up in smoke, July 3, 1928

Static electricity is generated in a truck by friction and may be caused by the slush of gasoline in the tank, or by the sliding motion of the tank on the cradle, or the cradle moving on the frame. It is also generated in the hose by friction of gasoline passing through the filling or discharge hose. There have also been instances of static electricity being attracted to and stored in tank trucks located under or close to steam line leaks.

The static electricity generated in the tank truck is held in storage in the truck body and frame by the rubber tires until such time as a ground has been established. It is therefore important that the truck and its tank be efficiently grounded before the operation of filling or discharging is commenced, as it is when connection is first made that most of the fires occur.

A small chain should be attached to both the tank and frame of the truck the other end to be allowed to drag on the ground or be placed on ground before commencing to load or discharge the load. While this chain should prevent static electricity from accumulating in the truck or tank under normal conditions, it must be borne in mind that it will not be effective when the ground is frozen or covered with dry ice or snow, and it is when these conditions exist that static electricity is most likely to be generated.

A permanent ground may be established at loading racks by driving an iron pipe or rod into the ground below the frost line and connecting it to one end of a copper wire, the other end to be attached to both the truck tank and frame before beginning to load. Separate tank wagons should be used for gasoline and refined oil, when practicable. Red metal tags marked "gasoline" and blue tags marked "refined oil" should be wired to the respective outlet faucets when both grades are carried on the same truck.

5. **Improper ventilation.** Windows and doors should be kept wide open when pumping gasoline and oil, as abundant air currents prevent the formation of explosive mixtures. This

*Engineer, National Petroleum Mutual Fire Insurance Co.

The result of a fire at a bulk plant of the O'Neil Oil Co., Elkhorn, Wis.

rule applied particularly to pump houses.

6. **Sparks from passing locomotives.** Sparks from locomotives have started fires under various conditions.

a. When loading tank cars, care should be taken that the dome cover is placed over the dome opening, but do not engage threads. A small stick placed under the dome cover will insure adequate venting.

b. Broken window panes in warehouses should be replaced immediately to prevent sparks entering, as numerous warehouses have been destroyed through carelessness in this respect.

c. Grass and weeds within an area of 75 feet should be cut frequently and removed from premises, as whole plants have been entirely wiped out by fires originating in this manner.

d. Spills along loading rack should be cleaned up at once, not only on account of sparks, but also because of the possibility of hot ashes being dumped.

7. **Inadequate venting of tanks.** Attention should be given to the size of vents of tanks, more particularly where there are more than one tank at plant. Where the vents are too small a fire in one tank will heat up adjacent tanks and if their vents are too small they will become ruptured and destroyed. To reduce the hazard, a tank of 10,000 gallons capacity should have a vent of at least two inches. This vent should be screened to prevent fire from entering the tank.

8. **Explosions caused by gas accumulations in basement.** The fire shown in illustration No. 2 was caused by the accumulation of gas in the basement of a warehouse, where an explosion took place, killing two people. Owing to the difficulty of insuring free circulation of air, it is not advisable to have basements in any bulk plants. Then, too, any tank leaks find their way to the basement.

9. **Lighting.** All wiring should be in accordance with the National Electric Lighting Code. Illumination should be limited to electric safety hand lamps or electric waterproof guarded extension lamps, equipped with vapor-proof globes.

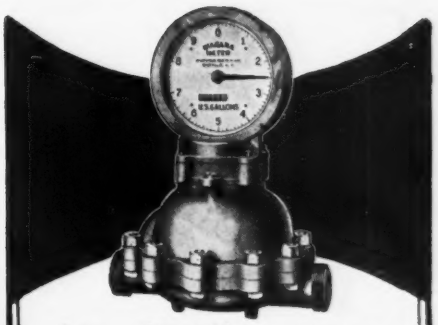
Model Fire Prevention Construction

WAREHOUSES should be constructed of brick or concrete (not cement blocks), not over two stories high, with slate or metal roof, not over 2000 square feet area. No basement. Steam or hot water heating to be generated in boiler house outside of building, or in brick enclosure inside, with raised door sill and fire doors on fusable links to entrance. There should be separate entrance to the boiler house, no openings between boiler house and warehouse.

Motors to be non-sparking type, maintained in good order, mounted on incombustible material, and not near woodwork. Vapor proof globes throughout. Fuses and switches to be in metal cabinets, and all wiring conduited.

A fence should surround the property.

The average warehouse should have



Are Gasoline Losses Puzzling You?

IF your experience is that of most bulk filling stations, gasoline losses *are* puzzling you!

The most careful of personal checking, because of human uncertainty, is sure to result in losses and errors.

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We have worked with the big chain of filling stations who have tried many kinds of oil, but finally decided to stick to Penn-Empire—because they knew that "When you buy Penn-Empire you get the best."

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a 40-gallon foam engine and not less than two two-gallon foam extinguishers on each floor. Fire foam extinguishers must be protected from freezing. Foamite should not be used for extinguishing electrical fires. A carbon tetrachloride extinguisher should be placed in a position on each floor to be used for the extinguishing of electrical fires. CAUTION! If carbon tetrachloride is used in closed room, VENTILATE PROMPTLY, as injurious gases are generated by the use of this chemical in fires. A watchman with sufficient clock stations, depending on size of plant, is a wise precaution.

Garage

Garage should be brick, concrete or corrugated iron, with cement floor. No basement. One two-gallon foam extinguisher if building is heated. If not, use one quart carbon tetrachloride extinguisher.

Pump House

Garage should be brick, concrete or corrugated iron, with cement floor. No basement. Ventilators should be installed on all sides of pump house at ground level. One quart carbon tetrachloride extinguisher, and let us repeat our recommendation that all doors and windows be kept open to insure the elimination of explosive gases.

General Suggestions

Precautions and preventions are better than cures. Be careful. Take no chances. Sometimes long acquaintance with gasoline and naphtha makes one indifferent to their hazards. Properly handled, they are safe. Carelessly handled, they may cause death and destruction.

Gasoline does not corrode the skin or clothes, wood or metal. It will not explode, as with dynamite, when struck in a can. Away from air, it will not even burn. Away from strong heat or spark, gasoline is perfectly safe.

But, if, when spilled on the ground, or in an open tank or can, a match flame or spark is brought in contact with it, it will take fire and burn fiercely. And if we allow gasoline vapor and air to mix together and then apply the spark, a terrific explosion may result.

These are the reasons why automobile engines must be shut down when filling; why gasoline must not be spilled so that it can be subjected to the heat of auto engine mufflers or sparks from the exhaust; why open lights must not be used where gasoline or gasoline vapors are in the warehouse, pump-house, at tanks or tank cars; why smoking is not allowed, and why care must be exercised to keep sparks from passing locomotives away from tank and tank car openings.

Water directly applied ordinarily will not put out a gasoline fire be-

cause water and gasoline do not mix. If the fire is on the ground water spreads it; if the tank is afire the water fills the tank and may push the burning gasoline out onto the ground and increase the fire area.

Kerosene, fuel oil and furnace oil will not take fire easily when a match flame is applied unless the oil is hot or when spread thin, as on a cloth. This is the reason for not keeping oily rags about warehouses. Ordinarily these oils are very safe. They rarely form an explosive mixture with air, and only when heated. But when once set afire, they burn with a strong flame. Water will not easily put it out.

Lubricating oils, greases, waxes and other viscous and solid petroleum products are ordinarily perfectly safe. But they are combustible. Therefore, they must not be allowed to accumulate loosely on floors or elsewhere.

While approved methods of construction reduce fire hazards, they cannot eliminate them entirely. We must not fail to take into consideration the human element—eternal vigilance. Good housekeeping in an oil warehouse is most important.

New Patents

October 2, 1928

REFINING

Method of Obtaining Nitrogenous Bases from Hydrocarbon Materials—Harry K. Ihrig, Martinez, Calif., assignor to Sumner E. Campbell, Associated, Calif., and to Associated Oil Company, San Francisco, Calif. Filed Dec. 21, 1926. No. 1,686,136.

Removing Amorphous Wax and Asphaltic Material from Oil—Thomas Clarkson and Hammond R. Heal, Coffeyville, Kans. Filed Oct. 29, 1921. No. 1,686,437.

Drier and the Combination thereof with Drying Oils—Hyym E. Buc, Roselle, N. J., assignor to Standard Oil Development Company of Del. Filed Sept. 16, 1927. No. 1,686,484.

Drier and the Combination Thereof with Drying Oils—Hyym C. Buc, Roselle, N. J., assignor to Standard Oil Development Company of Del. Filed Sept. 26, 1927. No. 1,686,485.

Drier and the Combination Thereof with Drying Oils—Hyym C. Buc, Roselle, N. J., assignor to Standard Oil Development Company of Del. Filed Sept. 26, 1927. No. 1,686,486.

Art of Obtaining Lighter Products from Hydrocarbons—Frank A. Howard, Elizabeth, N. J., assignor to Standard Oil Development Company of Del. Filed Aug. 16, 1922. No. 1,686,490.

Preparation of Fuel Oil—Wayne S. Hughes and James Harrop, Baytown, Tex., assignors to Standard Oil Development Company of Del. Filed Jan. 19, 1927. No. 1,686,491.

Refining Oils, etc.—Warren K. Lewis, Newton, Mass., assignor to Standard Oil Development Company of Del. Filed Aug. 23, 1923. No. 1,686,493.

PRODUCTION

Screen-Setting Apparatus—Joseph Dark Adams, Beaumont, Tex. Filed Sept. 16, 1927. No. 1,685,971.

Slip-Ring Socket—Frank J. Hinderliter, Tulsa, Okla. Filed Oct. 19, 1927. No. 1,686,134.

Combined Bailer and Jar—George A. Spang, Butler, Pa. Filed Jan. 12, 1923. No. 1,686,184.

Well Plug—Ferdinand J. Spang, Butler, Pa., assignor to Spang and Company, Butler, Pa. Filed Jan. 9, 1926. No. 1,686,185.

Polished-Rod Rotator—Alexander Boynton, San Antonio, Tex. Filed June 19, 1926. No. 1,686,261.

Stage-Lift Flowing Device—Alexander Boynton, San Antonio, Tex. Filed Dec. 10, 1926. No 1,686,262.

Pump Packer—John A. Yerkes and Rees H. Lemmon, Long Beach, Calif. Filed Jan. 22, 1927. No. 1,686,307.

Rotary Reamer—Alexander Boynton, San Antonio, Tex. Filed May 13, 1925. No. 1,686,403.

Oil-Well Torpedo—Thomas M. Winder and William R. Murrow, Independence, Kans. Filed May 16, 1927. No. 1,686,481.

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New York, Philadelphia, Boston, Chicago
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Fighting Fire Before It Happens

The single board walking to tank cars is made safe if held in place by cleats on each side of the loading rack toe board. This type of walkway is becoming obsolete

EVERY man engaged in the operation of loading railroad tank cars must be familiar with the regulations of the Interstate Commerce Commission dealing with this subject.

2. Frequent inspection should be made of grounding, bonding of loading rack and loading rack tracks and insulation of loading rack tracks.

3. Tank cars should be spotted on the insulated part of track only. In no case should a tank car be permitted to rest partly on insulated and partly on uninsulated tracks.

4. Frequent inspections should be made of vapor proof electric lighting equipment (globes, conduit, etc.) to see that it is properly operative.

5. Employees including train crews must use approved electric flashlights or electric lanterns around loading racks. Prohibit the use of open lights.

6. Nearby flame switch lamps must not be lighted or burning during loading operations.

7. Provide signs on each loading rack track which prohibit the approach of steam locomotives closer than 65 feet from the end of the loading rack. (Exceptions to be made only by permission of the loading rack foreman.)

8. Regulation blue flag stop signs must be placed one car length or more from the end of the loading rack before loading or repairing operations are started.

9. Each crew loading or working on tank cars should lock the switch on the track leading to the loading rack with its own lock. (Exception made only when a derail has been provided and is locked in a like manner.)

10. Coal burning locomotives working adjacent to loading operations should be equipped with screens on fire boxes and smoke stacks.

11. Locomotives should not be run over ground where cars have been filled or over sewers taking off gasoline. (Exception to be made only in special cases and they by permission of the loading rack foreman.)

12. When a tank car is not spotted over catch basin to sewer drain, extension drain pans should be provided or drip caught in a bucket.

13. Use standard car mover in hand spotting cars.

14. Prohibit the use of extension cords and open lights. Turn flashlight on before entering tank car and turn off after coming out of tank.

15. Use only non-ferrous or wooden hammers (bronze, brass, copper) around loading racks.

16. Loosen manhole cover by short vigorous pushes, not jerks, on a brass or wooden bar; face dome and make sure of footing.

17. Permit gas pressure, if present, to relieve itself through manhole cover vents before removing dome cover.

18. Remove bottom valve caps with a special long handled wrench provided for that purpose.

19. Report defective or leaky bottom valves to the proper authority and do not proceed with loading until repaired.

20. Inspect interior of tank car after removing manhole cover for foreign objects, debris, etc. (Cars used for the transportation of gasoline must be clean.)

21. Avoid breathing of fumes after removal of manhole cover and during inspection and removal of objects through dome.

22. A standard make of airline mask only should be used if necessary to enter the tank car to remove objects; also a life belt and a life line.

THE accompanying 53 suggestions to insure safety to oil company workers whose duty it is to load or unload tank cars of gasoline are taken from a Safe Practices Pamphlet recently published by the National Safety Council.

The pamphlet was drafted by H. N. Blakeslee, petroleum representative on the National Safety Council, together with the Engineering Committee, consisting of C. W. Smith, Standard Oil Co. of Indiana, chairman; R. E. Donovan, Standard Oil Co. of California; F. L. Newcomb, Standard Oil Co. of New Jersey, and C. L. Hightower, Texas Pacific Coal & Oil Co.

While it was written to apply particularly to refinery workers loading tank cars, many of its provisions apply as well to the man with the oil marketing company who unloads the tank cars. This summary from the pamphlet is republished here for his benefit.

A sample copy of the complete pamphlet, illustrated, can be secured from the Petroleum Representative, National Safety Council, 108 East Ohio St., Chicago. It is designated Safe Practices Pamphlet—Petroleum No. 3.

23. One man must stand by at the manhole opening to assist man within. Other help should be available to assist in case of an emergency.

24. Jumping from loading rack to tank cars or from car to car should be prohibited.

25. Rubber boots or shoes with rubber heels and soles should not be worn on account of the danger from static electric charges and the hazard of slipping.

26. Walk planks or platforms from loading rack to tank car should be frequently inspected and kept in good condition.

27. Walk planks or platforms leading from loading racks to tank cars should be securely fastened so that they cannot be displaced and cause falls of workmen. Adjustable walkways with hand rails are best.

28. Place loading spout in manhole opening, bringing end of loading line as close to bottom of tank car as possible in order to prevent excess fumes. Reduce fire and asphyxiation hazards.

29. See that the bonding line from the loading spout is in contact with the tank shell.

30. If the manhole cover chain is broken or defective put the manhole cover on loading rack platform. If it is left on tank car it may fall on some workman's head.

31. Tank cars found in bad order in any way should be reported to the repair department and not loaded until repairs have been made.

32. Avoid overfilling tank cars. Stand by to shut off loading line when load is reaching required amount.

33. When replacing manhole cover make sure that the gasket is in serviceable condition.

34. Hook the loading spout back on the loading rack out of the way when loading has been completed.

35. Keep loading racks clear of all unnecessary tools and material.

36. Automobiles or trucks must be kept away from loading racks when cars are being loaded.

37. Dirty waste, oily rags, paper, or any refuse should be put in a covered metal container and the contents removed frequently.

38. Tools, material and debris should be kept away from tracks and pathways.

39. Clean up spills immediately. Wash with water and police area until the vapors are gone.

40. Discontinue loading operations during electrical storms and replace the manhole cover.

41. Carry sample bottles in a case and see that pieces of broken bottles do not accumulate on or under loading racks.

42. Inspect cars thoroughly for leaks before approving for shipment.

43. Take care to label the loaded car with the placard designated by the Interstate Commerce Commission.

44. After taking locks off switches or derails stay from between or under tank cars.

45. Keep away from the tank cars when the train crew is coupling them together.

46. Repair or replace leaky valves in loading lines immediately.

47. Change gasoline saturated clothing immediately. Avoid gasoline burns.

48. Permit welders and others using open fires to work in the vicinity of the loading rack only by the written authority of the loading rack foreman.

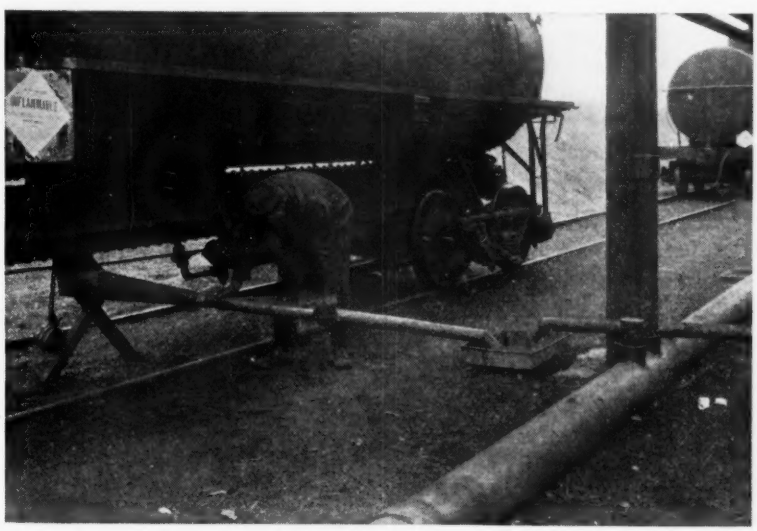
49. Smoking is prohibited at all loading racks, and it is advisable for car loaders to refrain from carrying matches.

50. Each car loader must be familiar with the fire fighting equipment and must know what to do in case of fire.

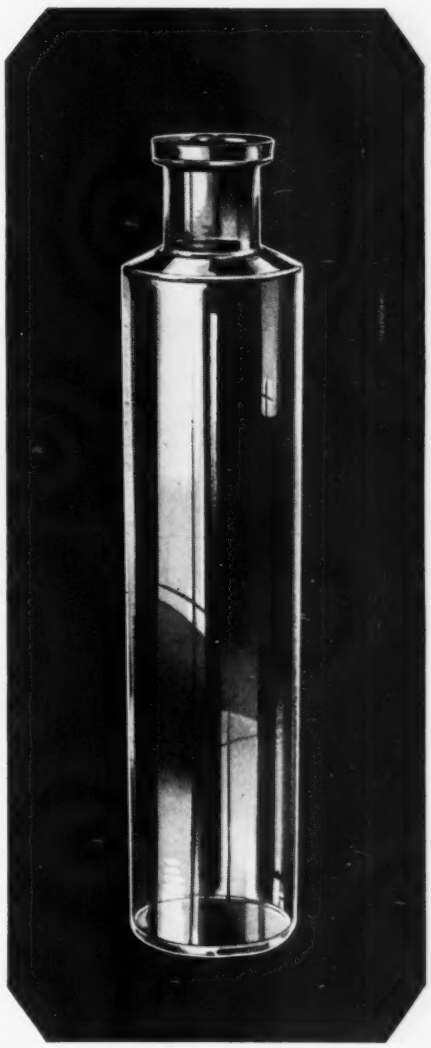
51. Car loaders should be familiar with the combustion and asphyxiation hazards of gasoline fumes and should know how to give artificial respiration.

52. Report all injuries no matter how small and get first aid.

53. When in doubt consult the loading rack foreman.



Drain spouts which catch the drips from the bottom of outlets and carry it to the recovery line help to reduce fire hazards



Put the Pressure on

that weak territory by adding these crystal clear containers to your sales staff.

Follow up your salesmen with samples and a letter. There is no better way of keeping contacts alive and no surer way of putting a complete story in your prospects' hands.

Our sample oil bottles are made from the finest perfume bottle glass in 2-4 and 8 oz. sizes, and are furnished with ground and polished bottoms if desired.

Samples on request

Illinois Glass Co.
Alton Ill.
ESTABLISHED 1873

AMERICAN AUTOMATIC AIR EQUIPMENT MEANS

SPEED

1
2 . . . ?
3 . . . ?

FIRST and outstanding feature of American Automatic Air Equipment is s-p-e-e-d. Real service for motorist, a real benefit to the station. Cars move in and out rapidly, no more cluttering of driveways.

Mr. Motorist drives up . . . sets dial at amount of air required . . . slips chuck on valve . . *air flows immediately* . . while tire inflates, a signal sounds at short intervals . . . it stops sounding when the proper pressure is reached . . . even though chuck is still on, the air stops and Mr. Motorist knows he has the correct pressure.

No more puttering around with gauges and old hose lines . . . there's action from the word go . . and what's most important, invariably *a sale of gas and oil as a reward for free air service.*

American AIR-O-STAT
Accurate Air—Brings Customers There
with QUICK-RITE Inflator
Model T-25 Mechanically Perfect

American Automatic Air Equipment furnishes the 100% accuracy made imperative by balloon tires.

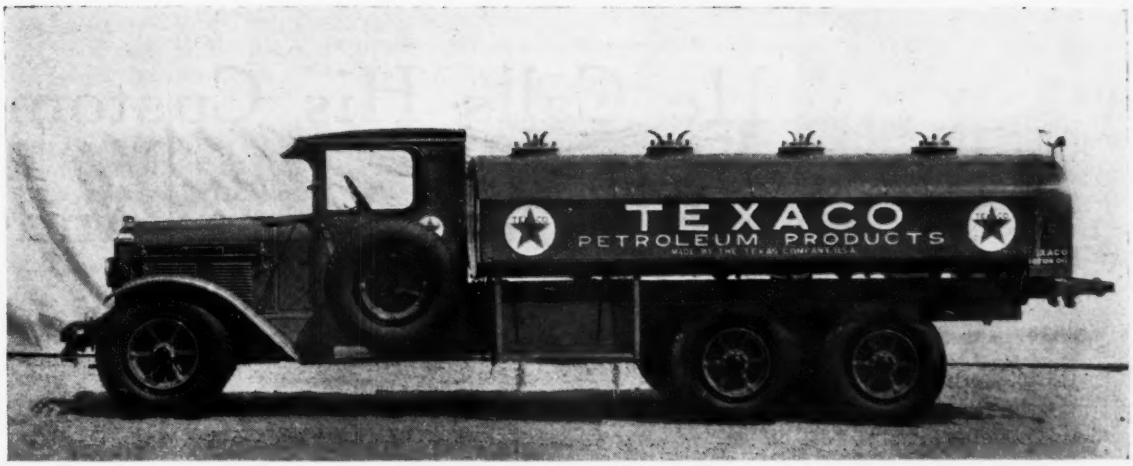
American Reel-O-Stat
with QUICK-RITE Inflator
Model T-31 With light fixture and globe lettered "Air"

2 more big features of American Automatic Air Equipment. Look for the next one in National Petroleum News of October 31

The AMERICAN OIL PUMP & TANK CO.

1713 DALTON STREET CINCINNATI, O.

INTERESTING FACTS FOR JOBBERS ON REQUEST . . . WRITE TODAY



This is the country truck, slim and high-powered with pneumatic tires. It makes 35 miles an hour with a 1000-gallon tank full

Tank Trucks—For Town and Country

CHICAGO

TANK trucks operated by The Texas Co., have inspired a great deal of favorable comment in the oil trade about Chicago recently. Besides being conspicuous in bright red and white, the company's new rolling stock is of a distinctive character, mostly in two entirely different types of construction.

Crudely distinguished, the two kinds of equipment might be called city trucks and country trucks. The city truck is built to carry a big load. The idea is that no motor vehicle can expect to exceed the ordinary speed of heavy traffic generally if it has to travel on big city streets where heavy traffic is permitted. Speed is not so much the object as to eliminate unprofitable empty mileage.

The country truck is built for speed. In the rural districts gasoline dumps are small as compared with those in the city and they are farther apart. So the country truck will travel loaded at 35 miles an hour on the open highway, saving time wasted between dumps and not constituting such an obstacle to other kinds of light and fast cars on the highway.

The semi-trailer job in an accompanying picture is the big town tank truck. The Texas Co. has two of them operating in Chicago, one serving retailers on the north side and making the Kingsbury plant its headquarters, the other operating out of the West Pullman plant on 121st street.

These machines have a maximum speed of approximately 16 miles an hour. The tanks hold 2400 gallons. One of them can almost empty an ordinary tank car in three trips. Although the rate of speed sounds slow, the average rate of travel on Western avenue or Halsted street where heavy trucks are allowed in Chicago is not any faster than that at hours of congestion. The big Texas Co. trucks can keep up with the procession and when they get where they started they have a load.

These two trucks are averaging better than a carload of gasoline a day on regular delivery. The exact amount of gasoline handled by one of them in September was 258,000 gallons.

The truck is composed of a 2½-ton Diamond "T" tractor, a Fruehauf trailer and a Heil tank. Both truck and trailer are equipped with air brakes. The small set of trucks seen suspended in the air under the tank are let down to the ground and used to support the front end of the tank when it is necessary to uncouple the job and run the tractor independently. There is only one trailer for each power unit and the only occasion for disconnecting the two is for convenient garaging. The job is too long to fit in one stall of the ordinary bulk plant garage, so it is made to occupy two stalls.

The country truck also is a Diamond "T" but in many ways it is different from the other machine. In the first place it is smaller. Although there is a powerful six-cylinder motor under the hood, the tank holds only 1000 gallons.

It is a 6-wheel job like the big city sister, but the tires are pneumatic and the wheels that carry the cargo are in tandem. This makes for a narrower job, which saves space on the road, and also distributes better the burden of the long tank.

This truck makes Champaign, Ill., its headquarters and is charged with the job of delivering all the gasoline to outlying points.

This is the city truck, geared to slow traffic but capacious, with solid tires. It makes 16 miles an hour with nearly 2500 gallons

Earl D. Averill, proprietor of Medina's first super service station

He Calls His Customers Jack and Mary, And—They Like It!

By N. M. Mainpa
N. P. N. STAFF WRITER

MEDINA, O., Oct. 15

"FRIENDLINESS—the spirit which makes my customers feel at home—is the chief factor which brings me business," said Earl D. Averill, proprietor of the first super service station in Medina.

"My station is in a farming community and the town has a population of only 3600. I call all my customers by their first names and insist on them calling me by mine. This, of course, creates a friendly feeling. It may not work in larger towns and cities where a station proprietor is not well acquainted with all his customers, but it works here where I know almost everyone and everyone knows me."

Mr. Averill has been in the oil business only since July when he opened Medina's first and only super service station. He does little advertising and he employs no merchandising stunts to put over his products. Since the opening week, his gasoline sales have increased rapidly.

Location, type of station, accessibility and surrounding scenery, were the prime factors that Mr. Averill considered before he entered the business.

From every standpoint his location at Broadway and Washington street is the most advantageous in town for such a business. It is in the center of the town.

Not only is it at the junction of highways 57 and 18, the latter the Chicago-Pittsburgh highway, but it is opposite Medina's public square. This square is also the town park and naturally has many large, stately trees which lend their beauty to the station site.

There are large overshadowing trees in every direction, so that whatever view of the station is gained, it is always framed in trees. If the site was carefully selected, the station was no less so. Mr. Averill traveled 1700 miles before he built it, inspecting super service stations in Michigan and Canada. Some of the ideas he gained from this inspection trip were incorporated into his building.

One attraction which brings motorists to this station because of its location is a band concert in the public square each Saturday evening in summer. This is the big night when all the farmers from the surrounding country turn out, as well as the people who live in town. The concerts bring them in large numbers to the square and Mr. Averill has found that many of them stop at his station then.

One block away from the station is the junction of state routes 3 and 42, which brings additional tourist trade.

The station itself has been designed along lines of simplicity. It is of white enameled brick, trimmed in bright green. Doors and window frames are trimmed in green. All interior woodwork is in dark oak.

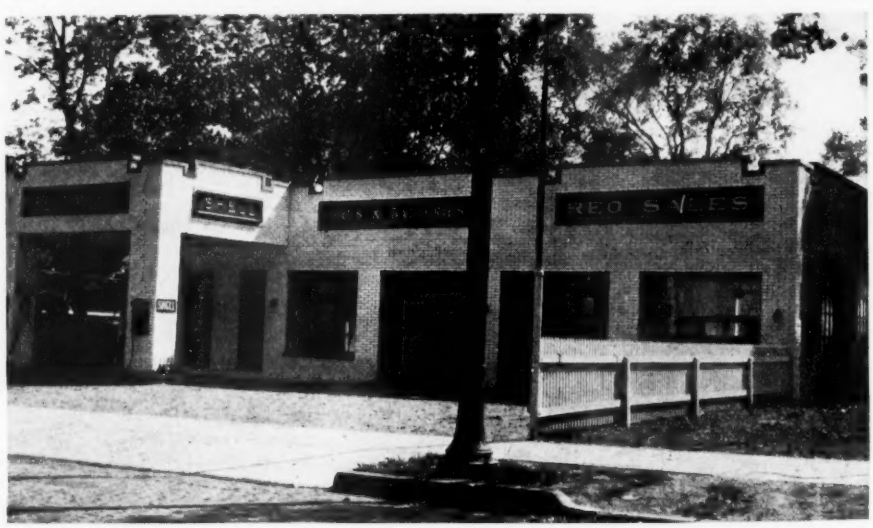
Eight lantern-type lamps are placed at regular intervals on the building, and one is in the center of the canopy ceiling. These are mostly for the artistic effect, however, rather than for the light they diffuse. Two floodlights, one at either front corner of the station property, furnish the necessary illumination.

There are six outlets for gasoline, electrically operated, and one emergency pump. There are two drain pits under cover at the rear where customers may watch the greasing and oiling process. Behind the pits is another room used at present as a garage.

Adjoining the station office in the front are sales rooms for tires and batteries and for Reo automobiles and trucks. Mr. Averill is dealer for the latter in Medina.

The station occupies a site 85 by 58 feet. The foreground has been graveled to allow plenty of space for cars. Wide, easily accessible driveways lead in from three points on two streets. The building is 58 by 50 feet. There are storage facilities for 6000 gallons of gasoline. Cost of the station, including the site, was $30,000.

The Free Oil Co., which operates some 20 service stations throughout the country, financed the super sta-



The main drive into Earl D. Averill's super service station at Medina, O. The drive takes up more than two-thirds of the station frontage and permits easy access for trucks and buses, many of which stop at this station. Drain pits and garage are in the rear, under cover

tion for Mr. Averill. He handles Shell gasoline, which the Free Oil Co. distributes and Hyvis motor oil.

The only advertising Mr. Averill does is in a community advertising paper which is mailed out each week to 1500 people in town. This paper includes only advertisements and all merchants use it.

Mr. Averill has never been in the oil business before, but was employed recently in a garage. Previous to that he was for many years in the meat and grocery business.

Cutler-Hammer Makes Engineering Changes

MILWAUKEE, Oct. 12.—Changes in the engineering department of the Cutler-Hammer Mfg. Co., manufacturer of electric control apparatus, with headquarters here, have been announced effective Sept. 1.

N. L. Mortensen, who has been with the company for 21 years, was appointed chief engineer. T. E. Barnum, formerly chief engineer, has been made consulting engineer to handle engineering problems both in and out of the plant.

Brundred Oil Insures Workers

NEWARK, N. J., Oct. 12.—Another oil company to join those taking out group life insurance policies for their employes is the Brundred Oil Corp., Oil City, according to the Prudential Insurance Co. of America.

The insurance covers the company's 58 employes and total amount of policy is $69,500.

HOUSTON, Oct. 11.—Mr. and Mrs. Judson Sides, Abilene, announce the marriage of their daughter, Marilyn, to Paul Bryan Hunter, Sept. 30. Mr. Hunter is division chief geologist of the Marland Production Co. After a trip to Houston, New Orleans, Shreveport and Oklahoma City, Mr. and Mrs. Hunter will be at home at 1633 Butternut street, Abilene.

LOS ANGELES, Oct. 15.—California Machinery & Supply Co., announces the removal of its offices in Los Angeles from 615 Roosevelt building, to 2449 Hunter street, where the warehouse is located. The above mentioned company is the California representative of the Titusville Iron Works of Titusville, Pa.

HOUSTON, Oct. 12.—E. R. Folmar, of the Magnolia Petroleum Co., has been appointed permanent chairman of the golf committee of the Purchasing Agents Association of Dallas. It is planned to hold spring and fall tournaments each year.

HOUSTON, Oct. 11.—J. Z. Hill, of the purchasing department of the Gulf Pipeline Co., Houston, has returned home after accompanying Mrs. Hill and their two sons to Norman, Okla., where the sons entered the university.

"QUICK-TOP" CARRYING CAN

HERE is the can that saves time and speeds up deliveries by its quick acting top—opens on one-eighth turn. Leak proof, gives lasting service. Answers all requirements better than any can yet produced. Made in black steel, painted in desired color, or hot-dip galvanized. Electric welded construction.

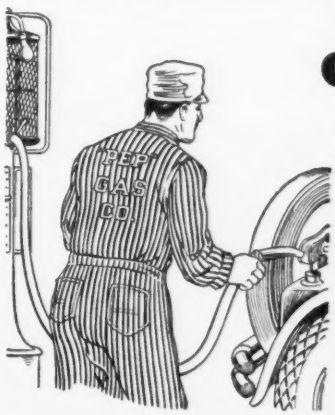
Perfectly balanced, carries nicely, pours smoothly, large handles easily gripped. Strong pressed chime permits dragging and banging without damage. Deeply concaved bottom prevents alteration of capacity, accurately calibrated to measure.

If you want to be convinced, send for a sample can; if you don't think it's the best can you ever saw or used, send it back, at our expense.

10 and 5 Gallon Sizes

COLUMBIAN STEEL TANK CO.
KANSAS CITY, MISSOURI

That impression of efficiency



When motorists drive up to your filling station are they served by neat appearing attendants?

Add to your service that one touch that makes it complete. Have your men uniformed — "Well dressed for work."

Standard Work Garments are made of the finest materials — triple stitched and reinforced — made to look right and wear right.

Standard Work Garments

$3.25 each

15% off in dozen lots. Special Prices in larger quantities.

Choice of blue denim, white, hickory stripe, express stripe, fancy blue and gold stripe. Union Made. Name or trade-mark embroidered in fast colors for 25c per garment.

The Standard Garment Co.
Toledo, Ohio

Gassing Slightly

by Rolling Stone
Oil Philosopher

SUCH a thought-provoking Mss. was received from Ian McNess that we at once threw it away. It was rescued by a char-woman and by mistake is herewith published.

Mr. McNess will be remembered as the author of several timely articles, which appeared, exclusively in NATIONAL PETROLEUM NEWS. The present narrative is no doubt inspired by the many orders which have been issued on proration, curtailment and what not. Mr. McNess may be said to live in Toronto. He writes that he has obtained a situation as Emeritus Professor of Psychotherapy and Lingerie in the Doodlebug Correspondence college and that this paper is the first lesson in the "Man, Know Thyself," series.

As having no bearing on the main issue, Mr. McNess propounds in his covering note two questions, answering them immediately:

Q. Why is it that Windsor, Ont.. has so many colored people and Woodstock has so many Scotsmen?

A. Windsor has first choice.

Q. Why does a woman rest her chin on her hand whilst thinking?

A. So that she will not interrupt herself by talking.

And now, having been thus stimulated, you may go with the story—Rollin Stone.

WHEREAS!

By Ian McNess

We are all creatures of habit. Some of these habits are quite good, such as applying listerine after a meal of steak and onions, changing our oil every 500 miles, returning our partner's lead at Bridge, getting to the office on time or going to church on Sunday.

Other habits are not so highly commendable, but we have no intention of airing our own or our neighbors' frailties and shortcomings by being specific.

The great point is that habits are insidious growths, creeping on one like old age or a thief in the night. We may not know how they got their first hold on us, we cannot tell when we were finally enslaved, but we cheerfully tread a well-defined path through life, doing stupid things or clever things, brave deeds or cowardly subterfuges, not because we are wise and heroic or asinine and spineless, but because we have the habit.

We—(and observe our editorial habit of saying "we" when we mean "I") we recently had a virulent attack of incipient habit which came near to wrecking our domestic happiness, social ambitions and business career and, as a warning to our readers who might, in days to come face a similar dilemma, we take this opportunity of exposing the method by which mankind is, as it were, habitualized.

It all began quite innocently and strictly in the way of business.

It fell to our lot to wade through a mass of legal documents wherein John Smith and his ilk on the one hand and John Doe et al. on the other hand, convenanted, convened, conspired and contracted to do or to refrain from doing, to help each other to do or assist one another in not doing, certain doings, deeds, or designs.

Our first feeling was one of utter helplessness in the face of so much prolixity, verbosity and circumlocution, but gradually we entered into the spirit of the game and became quite enthused over the "Assignees" and the "Assignors", the "Parties of the First Part" and the "Parties of the Second Part," the mysterious "These Presents" and the delightfully precise "by, if, from or when."

Here is a typical situation, Bill Jones has a ranch on which he raises fleabitten cayuses, a peculiarly Western species of equine. A dude from the City tells him there's oil under his alfalfa, not, in this case, his whiskers, and he decides to get Slim McGurk, the local post-hole expert to put down a well.

Does he go to Slim and say "Slim, you son of a gun, bring out your do-funny and perforate my hayfield?" No! He hires a lawyer, or better still a firm of lawyers, and they approach a lawyer or firm thereof who are acting as bottle-holders for Slim, and between them they draw a contract which runs to a half ream of foolscap and is decorated with sealing wax, ribbons and signatures until it looks like the Magna Charta.

At the final analysis it only means that Slim is to drill a hole for Bill but the episode has been taken from the mundane level and placed on a legal plane which makes everybody feel much more important and dignified, even if they don't know what it's all about, for it is easy to imagine an improvement in the social status of the "Assignor" or the "Party of the First Part" as against plain unvarnished "Bill." It may be more expensive but an "Assignee" should worry.

Having then dwelt with the legal fraternity and browsed amongst their "Presents" for days on end, we began to perceive a subtle change in our mode of address. We had ceased to call a spade a shovel and were prone to amplify and qualify all our utterances, even on trivial things.

For instance we awakened one morning to the dulcet chime of our alarm clock and a sleepy voice from the other "twin" inquired as to the time.

Instead of saying forthwith and outright that it was even later than that, we unconsciously or subconsciously gazed long and earnestly at the familiar dial (of the clock) and orated something in this manner.

"Time being the essence of the contract, and always excepting acts of God, the King's enemies, strikes, combinations in trade, famine, war, pestilence or any other untoward circumstance outwith the let, hindrance or control of the parties hereto, it would appear, seem and per adventure actually is, 15 minutes after the 7th hour ante meridian, providing always that this statement is made without malice or aforethought and is subject to the provisos hereinafter mentioned, being firstly, the accuracy of the said clock, timepiece or chronometer, secondly, the ability of the party of the second part to correctly tell, interpret or otherwise calculate the combination of numerals on the face of the aforesaid clock or timepiece, and thirdly the arbitrary apportionment of the solar system into hours and the extraneous effect of Daylight Saving."

Breakfast that morning was a silent meal, the partner of our joys and sorrows evidently being unable to decide whether to call a doctor or go home to her mother. The latter course almost gained the day when, in a coldly formal farewell, we stated that, in view of the strained marital relationship we might, perchance lunch, eat, dine, sup or otherwise find sustenance down town at midday. The family barometer promised "Stormy with showers" when we left.

At the office the legal fog still persisted.

It should have been a simple matter to inform a doting mother that we had no vacancy for her son on our staff of leisured messengers, but we admit to being rather startled at the effusion which eventually arrived on our desk for signature and which an indignant and latterly tearful stenographer swore to as being strictly in accordance with our dictation.

"Whereas," it read, "by an indenture dated the twenty-fourth day of August, A. D. 1928, Mrs. Amelia Sparks, of the City of Toronto, Ont., hereinafter referred to as the Party of the First Part, did advise, suggest, request and submit to the Party of the Second Part, hereinafter referred to as the Company, that it avail itself of the assistance, help, services or cooperation of her son, offspring or child, to wit the aftermentioned Eli Sparks, in whatever capacity the Com-

Spee

On the job in
tieups—that's
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Model "D
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Write for Catalog No. 201 giving details of *Superheaters* and other Standard equipment.

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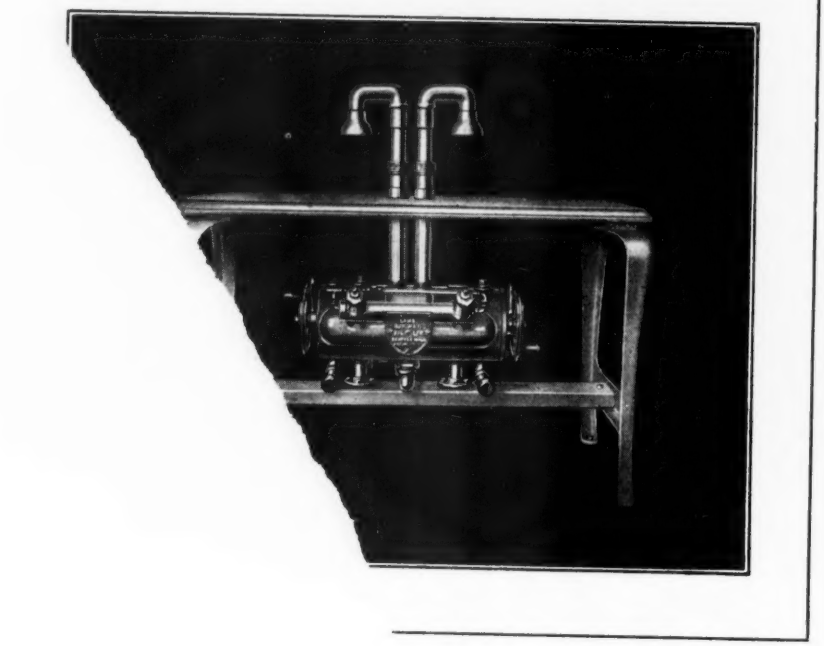

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Fee

Weighs and Fills . . .

. . . accurately

THE New Fee Automatic Filling and Weighing Machines provide the refiner with a means of accurately filling oils and greases rapidly and without waste.

Accurately, because the measurements are based on the principle of a fixed density of the material handled.

Rapidly, because the speed of the machines is only limited by the speed with which the operator removes the filled packages.

Without waste, because there is no drip from either spout after a discharge due to an automatic non-drip device.

And *economically*, because no special skill on the part of the operator is required.

Fee Machines will save time, material and labor costs.

Send for particulars to-day.

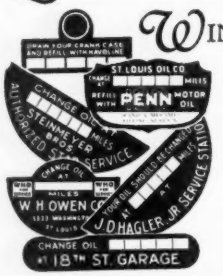
AMERICAN MACHINE & FOUNDRY COMPANY

Sales Offices: **511 Fifth Ave., New York City**

Works: **5502-5524 Second Ave., Brooklyn, N. Y.**

and Weighing Machines

CHANGE OIL STICKERS



WIN good will and build big repeat business for quality oil. Every service station should use them. We create individual designs and supply stickers in any quantity from 1000 to 1,000,000 or more. For a nominal charge, distributors can furnish their retailers with stickers bearing imprint of retailer's name and address.

Write for quotation and samples.

ST. LOUIS STICKER COMPANY
1633 Washington Ave. . . . . St. Louis Mo.

VISGAGE PAYS FOR ITSELF—

The Pocket Viscosimeter that Reads Sayboldt Seconds—in a Minute

Indispensable for Proper Handling of Lubrication Problems, Crank Case Draining and Reclaiming.

Send for Booklets for Visgage and Dilutometer

LUBRICATING APPLIANCE M.FG. CO., INC.
5638 Lake Park Ave. Chicago, Ill.

"WHAT ABOUT THE OILGRAM?"

The executive of a gasoline company on the west coast recently inquired of a Tulsa executive, who replied in part. . . . .

"If you were to wire me for Mid-Continent gasoline prices I would phone a member of the OILGRAM staff, and my reply to you would be the GIST OF WHAT HE TOLD ME. The OILGRAM staff is in direct and close contact with the markets almost every hour of the business day.

THEY KNOW THEIR BUSINESS"

You, too, can have the benefit of this close contact with all phases of the market at all the principal refining and marketing centers. The service costs only $25 a quarter, or $75 a year, payable in advance. Approximately 30 cents a day—less than the cost of one wire or one phone call.

Why not avail yourself of this service—send your order with check to the nearest mailing point.

TULSA—904 World Bldg.
CHICAGO—35 East Wacker Drive
NEW YORK—342 Madison Avenue
CLEVELAND—1213 West Third St.

pany might direct and at their sole and only discretion, *Providing Always* that the aforesaid Eli Sparks be paid, rewarded, reimbursed or compensated by a regular hourly, daily, weekly or monthly wage, emolument or salary payable at par in good and lawful currency:

"And whereas the Company, its heirs successor and assignees has the sole right and privilege, acting on its own behalf or through its duly and lawfully accredited representatives, to hire, cause to be hired, or refrain from hiring such technical, professional or clerical assistance as it may or may not require, under the powers conferred upon it by its Charter of Incorporation:

"Now this indenture witnesseth that, by these Presents, the Company on the one hand, notifies the Party of the First Part, on the second-hand, that it does not, will not, cannot and shall not, employ, cause to be employed, secure or cause to be secured, solicit or cause to be solicited, the aforementioned assistance, services, help or cooperation of the aforesaid Eli Sparks, his heir, successors or assignees.

"In witness whereof we have hereto affixed our corporate seal and this indenture is herewith and hereby duly executed."

In desperation we sent the lady a telegram saying boldly "We cannot hire your son," and in order to chase the legal jinx, called it a day and set off for the ball game.

It turned out to be one of those hectic "Pitchers battles" where the score was tied 19 all at the end of the 3rd, the fans were in their most bloodthirsty mood and the local hero was called out at the plate on a close decision.

A large, over-stuffed gentleman of the truck-driver persuasion was seated close by, and in a strangled basso, due to high blood pressure and peanuts, he invited us to acquiesce in his opinion of the umpire.

Care and courtesy demanded that we should not say him "Nay" but the legal virus was too strong, and, whilst the paying patrons raved all around us, we calmly and judiciously voiced our well considered opinion.

"Whereas," we said, "it has seemed lawful and expedient that the ruling authority, executive, or promulgators of this particular and specific group of clubs, combinations or associations, generally and commonly known as a League, delegate their authority in the conduct and supervision of these contests, matches or games to a legally appointed, duly accredited, and lawfully recognized representative or assignee, with power vested in him to umpire, referee and arbitrate on all points which arise or may arise in the discharge of the hereinbefore mentioned duties.

"And whereas by reason of the powers and privileges enuring to the said umpire (or aforesaid arbitror) he, at his discretion, of which he is

the sole judge, may decide, declare and dictate as to the questions, controversies or situations coming within his purview:

"And whereas there is not allowed or allowable in law or in equity an appeal from or against such decisions, declarations or dictations:

"Then it must be and is assumed that the aforementioned referee is upheld, justified, and confirmed in his acts, decisions and declarations and that he is absolved, acquitted and freed from any suggestion of bias, error, or partisanship, and may not be held liable in his judgment, or assailed in his bona fides."

"Besides," we added in a lucid moment, "the big bum was out at the plate by a mile."

We are always willing to give a person the benefit of the doubt. It may be that our casual acquaintance *did* intend to throw that empty pop bottle under the seat, it even may be that he stepped on our classic features in error and that, in our hurry to leave, we accidentally brought our eye into close contact with his bunched digits.

Be that as it may, we have decided that, if we *must* have a habit of speech, it will henceforth be far removed from legal technicalities and we are now cultivating the idiom of the proletariat, Whereas! and how!!

"TAG" To Show Refinery Devices

BROOKLYN, N. Y.—A panel showing the complete line of gauging equipment for tank cars and storage tanks, including outage and innage rules, and gauging tapes, will be one of the features of the exhibit of the C. J. Tagliabue Mfg. Co. at the International Petroleum Exposition at Tulsa.

Other refinery equipment will be on display, including A. S. T. M. oil testing instruments, automatic controllers and thermometers. Many of the instruments have come out recently among these being the new Saybolt viscosimeter and the new TAG automatic recorder-controller, now being made in both single and double system types. The new viscosimeter with its interchangeable tips does the work of two instruments, the company claims.

Other new developments in automatic controllers, recording thermometers and recording pressure gages will be shown, including a special heavy-duty liquid level controller designed for oil refinery work.

U. S. Royalties Total $258,135

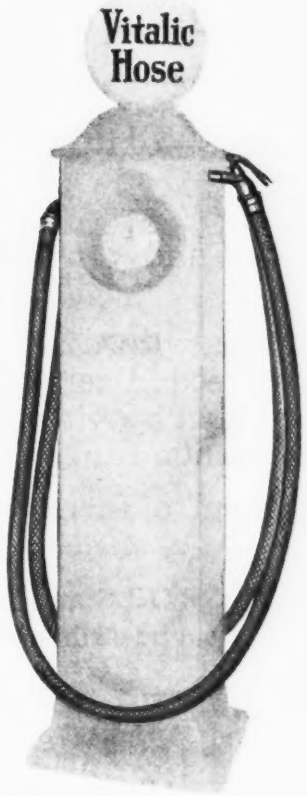
CASPER, Wyo., Oct. 15.—Federal royalties from oil and gas operations in the Rocky Mountain region in August totaled $258,135.72. This amount was made up of $241,641.23 from oil, $7,841.21 from natural gas, and $8,653.28 from natural gasoline. Almost all of this originated in Wyoming.

VITALIC

REG. U.S. PAT. OFFICE

GASOLINE PUMP-HOSE

There's a 1000 Day Warranty on Every Length



Vitalic Gasoline Hose is the result of twenty-five years of experiment and experience in the manufacture of high grade rubber products.

Vitalic Gasoline Hose is a GOOD hose, therefore we sell it backed by a 1000 Day Warranty.

Vitalic Gasoline Hose has real SERVICE built into it---we want you to get the ***full benefit*** of this high quality product---therefore, if through carelessness or accident, the hose is damaged, return it to us at our factory, Erie, Pa. and we'll replace it or repair it, under our 1000 day Warranty.

Ask for "Vitalic" and get the benefit of the best.

Branches

New York	Pittsburgh
Chicago	Cleveland
Boston	Buffalo
Philadelphia	Detroit
Baltimore	St. Louis
Dayton	

C. C. KERNER,
152 Chambers St., New York.
Exclusive Foreign Representative.

Continental Rubber Works,
Erie, Pa. U.S.A.

Post Office Drawer O

IMPERIAL FURNACE OILS

Low Flash **Zero Cold Test** **High B. T. U. Value**

and

Low Volatility

The heating season is here and you will need quality furnace oils at a saving.

Low Flash: Start your fires with ease
Zero Cold Test: Uniform feed in zero weather
High B. T. U. Value: Low gravity with more pounds per gallon
Low Volatility: Low distillation range

These are the "four horsemen" of furnace oil quality

We make ZERO FURNACE OILS at two of our refineries, El Dorado, Arkansas, and Ardmore, Oklahoma.

Quality and Service

OUR REGULAR PRODUCTS

56/58 U. S. Motor Gasoline
58/60 U. S. Motor Gasoline
60/62 400 E. P. Gasoline
68/70 Aviation Gasoline
High Compression Gasoline
42/44 Kerosene
Zero Furnace Oils
28/32 Gas Oil (Straw)
32/36 Gas Oil (Straw)
Tractor Fuel
Diesel Fuel
16/20 Fuel Oil
Road Oils
Transmission Oils

"We meet equivalent competition"

IMPERIAL REFINING COMPANY

General Offices

TULSA, OKLAHOMA

ON THE LAZY BENCH

Mutt—"Jeff, have you ever spoken before a large crowd?"
Jeff—"Sure, I have."
Mutt—"What did you say?"
Jeff—"Not guilty."

—Our Sun

* * *

"Are you the groom?" asked the bewildered old gentleman at a very elaborate wedding.
"No, sir," was the reply of the young man. "I was eliminated in the preliminary try-outs."

—Skelly News

* * *

"The man I marry must be a gentleman and a scholar," Enid proclaimed.
"My dear," objected June, "that's asking too much of any college man."

—Skelly News

* * *

"We got a new baby at our house."
"Didya turn in the old one?"

—Our Sun

* * *

Judge—What's the charge, officer?
Cop—Arson, your Honor, burning up the road.

—Loreco Diamond

* * *

Teacher: "When was the radio first operated in America?"
Willie: "When Paul Revere broadcasted on one plug."

—Skelly News.

* * *

They were eating in a place where something else than tea was served in teacups.
"I've a darn good notion," said Wimps, "to buy this place."
"Wait till we've had a couple more," replied Rowley, "and I'll sell it to you."

W. O. W.

* * *

Nip: "The girls in our office wear desk hosiery."
Tuck: "What do you mean, desk hosiery?"
Nip: "Roll tops."

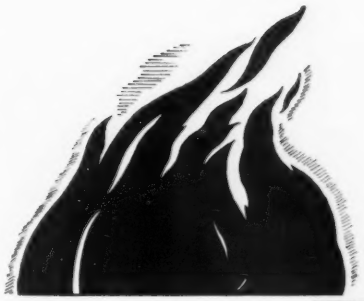
—Skelly News.

* * *

Yvonne: "What would you do if you had had five dates with a man and he had never attempted to kiss you?"
Paulette: "I'd lie about it."

* * *

"Nurse," said an amorous patient, "I'm in love with you. I don't want to get well."
"Cheer up, you won't," she assured him. "The doctor's in love with me,



When Fire Strikes are you Ready?

EVERY far-sighted executive in the oil and gas business wants to know *for certain* that fire does not menace his refinery—bulk stations or filling stations.

Are you equipped to overcome fire no matter where it starts?

The important factor in fire protection is to have dependable equipment of the right type in the right place.

Wherever oil and gas are handled there are many types of hazards. You may be overlooking some dangerous hazards now. For the sake of your business and your own peace of mind call in our Engineers for a complete inspection. They will recommend the types of Pyrene Fire Equipment exactly suited to your needs.

The Pyrene line is most complete, from hand extinguishers to automatic foam accumulators—especially designed for protection of refineries, bulk and retail stations. It contains the very latest developments in fire fighting units. Absolute dependability has led to the selection of Pyrene Fire Equipment by leading concerns in the oil and gas business.

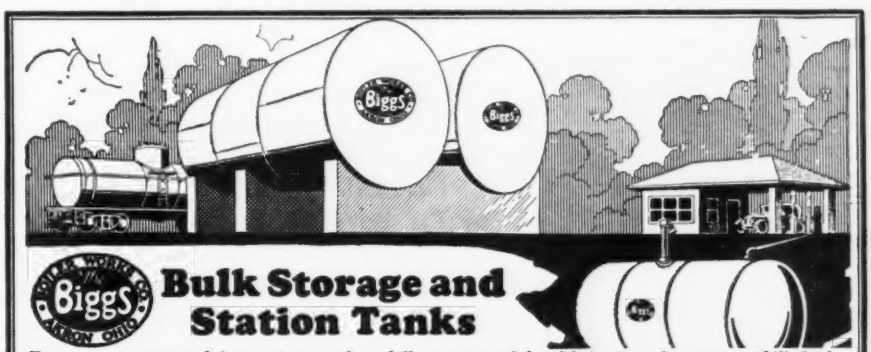
Sold through Auto Accessory, Hardware, Mill and Oil Well Supply jobbers and dealers.

Pyrene Manufacturing Company

NEWARK, NEW JERSEY

Branches: Atlanta Chicago Kansas City San Francisco

Makers of Fire Equipment since 1907—Makers of Pyrene Tire Chains



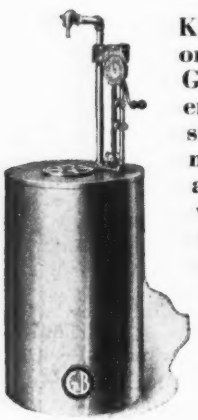
The Biggs Boiler Works Co. Akron, Ohio

Bulk Storage and Station Tanks

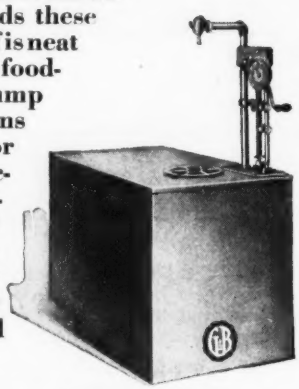
Forty years successful experience; plant fully equipped for fabricating plate up to 1½" thick.
Pressure Stills for Cracking Process - Fractionating Towers - Dephlegmating Towers, Bubble Towers - Heat Exchangers - Agitators - Steam Stills - Crude Stills - Condenser Boxes, Run Down Tanks - Blending Tanks - Hemispherical Tanks - Blow Cases - Acid Tanks, Compounding Kettles - Storage Tanks to 80,000 Barrels - Smoke Stacks and Breechings, etc.

THE BIGGS BOILER WORKS COMPANY, Buchtel and Bank Streets, AKRON, OHIO
Eastern Sales Office: 300 Madison Ave., New York *Western Sales Office:* 35 South Dearborn St., Chicago

G&B kerosene Equipment Simplifies sales



KEROSENE handling demands no funnels or measuring cans—it only needs these G & B outfits. The equipment itself is neat enough to keep company with foodstuffs on the store floor. The pump measures out gallons, half-gallons and quarts without spilling or waste. Either cylindrical or rectangular tank outfits are available. Both are well-built and inexpensive — and up to the high standard of the Gilbert & Barker line. Write for Bulletins T-180-B and T-180-C.



GILBERT AND BARKER
MANUFACTURING COMPANY
PUMPS AND TANKS FOR THE OIL TRADE
SPRINGFIELD, MASS.

Visible Gasoline Pumps, mechanical measure or sight measure, hand or air operated, equipped with the famous NULTRA bowls. Also piston type pumps, with visible discharge. Pump and tank outfits for motor oils, including the popular "NARRO-LUBE" type. Special pipe sealing compound for gasoline and oil pump and tank installations.

USED GAS PUMPS

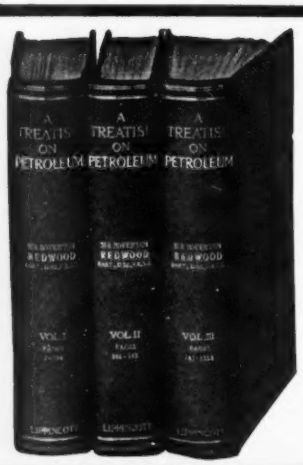
PISTON AND VISIBLES—VARIOUS MAKES
ALWAYS ON HAND

Prices very Reasonable

Address H. W. Vogt

MILWAUKEE TANK WORKS

Milwaukee, Wis.



Information on all branches of the petroleum industry is to be found in the 4th edition of A TREATISE ON PETROLEUM by Sir Boverton Redwood.

To obtain this valuable set make your check for $30 payable to

NATIONAL PETROLEUM NEWS
1213 W. 3rd St. Cleveland, Ohio

too, and he saw you kiss me this morning."

* * *

A Necessity

Millson (who has received a salary increase)—Congratulate me, my dear. I think I am getting ahead, at last!

Mrs. Millson (dryly)—Well, goodness knows, you need one!"

—Magnolia Oil News.

* * *

To Tom, who had been cutting up, his mother exclaimed wearily—"Why can't you be a good boy?"

"Well, mother, I'll be good for a nickel."

Mother—"For shame, you ought to be like your father, good for nothing."

—Skelly News

* * *

We now hear of an old Scotchman who amused himself for an afternoon throwing pennies to the kids—and then died of heart failure when the string broke.

—Our Sun

* * *

The crap game was over, and Caesar, the heavy loser, sadly pocketed the small amount of loose change he had remaining.

"Boy," Napoleon, the winner, asked, "yo' ain't much good at seben come eleben, is you'?"

"Nope," answered Caesar. "Ah's always afraid it's gwine come out seven come Lebenworth."

—Skelly News

* * *

McNab, Jr. "Oh, father, I saved five cents today. I ran all the way to school behind a street car."

McNab, Sr. "Hoot, Sandy—for shame! Ye should have run behind a bus and saved a dime."

—Our Sun

* * *

"That guy speaks fourteen languages."

"Ah, a polyglot."

"Ah, a polyglutton!"

—Skelly News

* * *

New Scotch song: "Let the Rest of the World Go Buy."

—Our Sun

* * *

The telephone girl was on her vacation. One day when she was out fishing someone in another boat called. "Hello!"

Just then a bob of the cork told her she had a bite.

"Line's busy." she answered, and pulled in her fish.

—Skelly News

* * *

An optimistic Colorado farmer, on seeing some clouds floating by, remarked: "Well, I guess we're going to have some rain."

"Aw," said his pessimistic neighbor, an ex-railway man, "those are just empties coming back from Iowa!"

—Skelly News

How much of *your* business automatically repeats?

Whatever percentage it may be, it is this business that earns your profits. It costs real money to sell new customers and but little to keep them once they are on your books. And it is particularly easy when you give greater value—the kind of 1000 mile motor oil values you can get from -TP- Blending Bright Stocks. Write, wire or telephone for samples and quotations. From Ranger Parraffin Base Crude uncontaminated—carefully refined.

Specifications
913

Gravity	24-25
Flash	440-450
Fire	500-510
Vis. at 210	80-90
Pour Test	15-20
Color	7 NPA

Specifications
915

Gravity	24-25
Flash	490-500
Fire	550-560
Vis. at 210	120-130
Pour Test	15-20
Color	8 NPA

TEXAS PACIFIC COAL AND OIL COMPANY
INCORPORATED — 1888
FORT WORTH, TEXAS

Pennsylvania Oil PLUS

Plus what? —Plus the fact that it is blended from 450 Bright Stock (Sharples Process) refined in ONE Freedom Plant — and from 100% Pennsylvania Crude Neutrals refined in ANOTHER Freedom Plant. Thus, under one supervision, with the one guarantee of a 49 year old refinery, a line of Freedom 100% Pennsylvania Motor Oils is blended to specifications which appeal to discriminating jobbers — a complete line of oils that enable you to build your business and your customers' businesses on repeat order foundations.

Guaranteed 100% PURE PENNSYLVANIA OIL

Permit No. 31

For nearly 50 years, The Freedom Oil Works Company has specialized in the refining and blending of 100% Pennsylvania Oils. In one way, that explains why jobbers the country over come to this concern for their requirements.

Deliveries can be made immediately, in tank cars, compartment tank cars, barrels, or drums.

Write for quotations.

Also available for immediate shipment

450 Bright Stock (Sharples Process) which requires less Neutral to blend to the ordinarily required specifications.

100% Pennsylvania Motor Oils, *blended to your own Specifications*, from Freedom 450 Bright Stock and Freedom 100% Pennsylvania Crude Neutrals.

Freedom Quality Stocks
600 Steam Refined
635 Steam Refined
650 Steam Refined

Freedom 300 Mineral Seal Oil made to Railroad Specifications.

Freedom Filtered Burning Oils.

The Freedom Oil Works Company
Freedom, Penna.
Established 1879
Refineries at Freedom and Coraopolis, Pennsylvania

FREEDOM

New Stations Building

Langdon, Kans.—F. Harlan, filling station.
Topeka, Kans.—P. M. Sewell, filling station.
Plymouth, O.—Plymouth Tire & Auto Accessories, filling station.
Beatrice, Neb.—B. H. Hotchkiss, filling station.
La Grange, Tex.—W. P. Jacobs, filling station.
Kenneth, Mo.—Mid-Way Shell Service Station, filling station.
Sulphur Springs, Tex.—Gulf Refining Co., filling station.
Fargo, N. D.—W. H. Flynn, filling station.
Moore, Mont.—Alva Stevens, filling station.
Crossett, Ark.—Crossett Lumber Co., filling station.
Sherman, Tex.—Continental Oil Co., filling station.
Crofton, Neb.—Sinclair Oil Co., filling station.
Alamo, Tex.—Elliott & Herwig, filling station.
Jefferson City, Mo.—Capital City Oil Co., filling station.
Kansas City, Mo.—A. Kellam, filling station.
Logan, Okla.—C. Oliver & C. Myers, filling station.
Anaconda, Mont.—A. J. Tuchscherer, filling station.
Paris, Tenn.—Kendall Oil Co., filling station.
San Anselmo, Calif.—Richfield Oil Co., filling station.
North Topeka, Kans.—S. Galitski, filling station.
Topeka, Kans.—Phillips Petroleum Co., filling station.
Grand Rapids, O.—A. A. Smith, filling station.
Grafton, N. D.—W. J. LeClair, filling station.
Muscatine, Ia.—Herwig Oil Co., filling station.
North Manchester, Ind.—Standard Oil Co., filling station.
Bloomington, Ind.—Standard Oil Co., filling station.
Poseyvill, Ind.—Mr. Murphy & Son, filling station.
Paris, Ill.—Mid-Continent Petroleum Corp., filling station.
Riceville, Tenn.—Sinclair Refining Co., filling station.
Cannelton, Ind.—Mr. Landgrebe, filling station.
Ridgeland, S. C.—G. L. Langford, filling station.
Rogers, Ark.—Roxana Petroleum Corp., filling station.
Tennille, Ga.—C. J. Lord, filling station.
Greer, S. C.—J. C. Cunningham, filling station.
Cambridge, O.—T. Coines & G. Brown, filling station.
Brooklyn, N. Y.—Ella Leshnower, filling station.
Delphos, O.—Ed Morris, filling station.
Waukon, Ia.—Mid-Continent Petroleum Corp., filling station.
Urbana, O.—M. H. Crane estate, filling station.
Wescosville, Pa.—R. E. Edelman, filling station.
Allentown, Pa.—Penn Rock Oil Co., filling station.
Fairmont, W. Va.—General Oil Co., filling station.
Johnstown, N. Y.—Fort Johnson Coal Assoc., filling station.

Makes All Metal Filling Stations

CANTON, O.—The architectural beauty, low cost and durability which the Union Metal Mfg. Co. here says it combines in its steel filling stations and equipment, are being brought to the attention of the oil marketing trade and the public generally through that company's advertisement in an October issue of the Saturday Evening Post.

For 21 years the company has been producing ornamental lamp standards, porch columns, traffic standards, etc., for city thoroughfares and homes, and five years ago began the manufacture of filling stations of Union metal. These filling stations can be had as simple or ornamental as desired.

Compilation Of Mid-Continent Refinery Operations

All Rights Reserved to The National Petroleum Publishing Co.

National Petroleum News

Mid-Continent Refinery Operations Week Ended October 12 (By Telegraph)

	Kansas	Oklahoma	North & Cent. Texas	North La.-Ark.	Total Week Ended Oct. 12	Total Week Ended Sept. 14
Plants Reporting	12	29	29	12	82	82
Da. Av. Cap. (bbls.)	92,000	160,200	130,100	54,900	437,200	434,700
Da. Cracking Capacity	30,700	52,600	17,200	22,700	123,200	123,200
Da. Av. Crude Runs	66,940 + 2.8	121,722 + 14.2	81,574 — 4.8	66,304 + 3.5	336,540 + 4.7	354,736
Da. Av. Other Oils	7,634 + 58.0	6,768 — 52.0	6,186 — 14.4	1,415 + 1.1	22,003 — 20.2	20,886
GASOLINE—Gallons						
Stocks, Oct. 5	5,974,000	24,584,000	13,169,000	5,609,000	49,336,000	46,993,000
Prod. 10-5 to 10-12	10,219,000 + 7.9	19,620,000 + 6.2	10,046,000 — 0.7	6,362,000 + 0.02	46,247,000 + 4.1	46,811,000
Ship. 10-5 to 10-12	9,574,000 — 7.3	19,220,000 + 9.5	8,549,000 — 13.6	6,776,000 + 9.8	44,119,000 + 0.4	47,034,000
Stocks, Oct. 12	6,619,000 + 10.8	24,984,000 + 1.6	14,666,000 + 11.4	5,195,000 — 7.4	51,464,000 + 4.3	46,770,000
Ratio Sales to Prod	93.7%	98.0%	85.1%	106.5%	95.4%	100.5%
KEROSENE—Gallons						
Stocks, Oct. 5	7,008,000	3,900,000	1,726,000	761,000	13,395,000	13,266,000
Prod. 10-5 to 10-12	1,839,000 — 7.9	2,466,000 + 25.0	1,575,000 + 5.3	211,000 — 63.6	6,091,000 + 0.8	6,809,000
Ship. 10-5 to 10-12	1,765,000 — 32.1	2,161,000 + 0.3	1,306,000 — 13.9	181,000 — 44.5	5,413,000 — 17.9	6,761,000
Stocks, Oct. 12	7,082,000 + 1.1	4,205,000 + 7.8	1,995,000 + 15.6	791,000 + 3.9	14,073,000 + 5.1	13,314,000
Ratio Sales to Prod	96.0%	87.6%	82.9%	85.8%	88.9%	99.3%
STOVE DISTILLATE—Gallons						
Stocks, Oct. 5	2,110,000	3,332,000	665,000	21,000	6,128,000	5,608,000
Prod. 10-5 to 10-12	51,000 — 80.9	631,000 — 5.1	206,000 — 55.4	87,000 + 50.0	975,600 — 32.9	708,000
Ship. 10-5 to 10-12	574,000 +200.5	611,000 — 11.1	432,000 — 4.8	76,000 — 20.8	1,693,000 + 18.6	436,000
Stocks, Oct. 12	1,587,000 — 24.8	3,352,000 + 0.6	439,000 — 34.0	32,000 + 52.4	5,410,000 — 11.7	5,880,000
Ratio Sales to Prod	1125.5%	96.8%	209.7%	87.4%	173.6%	61.6%
GAS OIL—Gallons						
Stocks, Oct. 5	6,610,000	38,989,000	6,529,000	6,193,000	58,321,000	56,756,000
Prod. 10-5 to 10-12	1,660,000 + 20.2	1,856,000 — 54.8	1,866,000 — 28.2	2,503,000 + 4.7	7,885,000 — 24.7	7,743,000
Ship. 10-5 to 10-12	1,565,000 + 15.3	1,801,000 — 39.0	899,000 — 50.4	2,397,000 — 2.7	6,662,000 — 22.4	7,158,000
Stocks, Oct. 12	6,705,000 + 1.4	39,044,000 + 0.1	7,496,000 + 14.8	6,299,000 + 1.7	59,544,000 + 2.1	57,341,000
Ratio Sales to Prod	94.3%	97.0%	48.2%	95.8%	84.5%	92.4%
FUEL OIL—Gallons						
Stocks, Oct. 5	27,888,000	57,644,000	72,210,000	22,603,000	180,345,000	157,674,000
Prod. 10-5 to 10-12	7,211,000 + 6.7	9,161,000 + 56.2	10,241,000 — 1.6	7,797,000 + 13.4	34,410,000 +15.0	39,803,000
Ship. 10-5 to 10-12	7,165,000 + 25.2	8,434,000 + 3.8	10,870,000 + 6.3	8,042,000 + 5.4	34,511,000 + 8.8	34,313,000
Stocks, Oct. 12	27,934,000 + 0.2	58,371,000 + 1.3	71,581,000 — 0.9	22,358,000 — 1.1	180,244,000 — 0.1	163,164,000
Ratio Sales to Prod	99.4%	92.1%	106.1%	103.1%	100.3%	86.2%

Gasoline Produced by Various Methods, Week Ended October 12

	Kansas	% of Total	Oklahoma	% of Total	Texas	% of Total	Louisiana-Arkansas	% of Total	Total	% of Total
Straight Run	6,748,000	66.1	12,818,000	65.3	7,608,000	75.7	2,968,000	46.7	30,142,000	65.2
Cracked	2,855,000	27.9	5,655,000	28.8	2,042,000	20.3	2,767,000	43.5	13,319,000	28.8
Natural	616,000	6.0	1,147,000	5.9	396,000	4.0	627,000	9.8	2,786,000	6.0
Total	10,219,000		19,620,000		10,046,000		6,362,000		46,247,000	

+ or — columns are % change from previous week.

Gasoline Shipments Still Increasing in Mid-Continent

Staff Special—By Telegraph
TULSA, Oct. 16

CRUDE runs at 82 refineries in the Mid-Continent field increased 15,000 barrels daily average during the week ended October 12 according to reports gathered by NATIONAL PETROLEUM NEWS. Daily average runs for the week were 336,540 barrels as compared with 321,510 barrels the first week of October. Charges of partly refined oils to stills were reduced 5,566 barrels daily average to 22,003 barrels per day.

All groups in the Mid-Continent increased crude runs with the exception of Texas. In that state 29 reporting plants reduced their runs 4,000 barrels daily average to 81,574 barrels per day which is 19,000 barrels below the peak runs reached in that district in the latter part of August.

The largest increase in crude runs

Summary for the Month

Production and shipments, all reporting refineries, for four weeks ended Oct. 12. Change in stocks figured from Sept. 14.

	Gallons
GASOLINE	
Production	184,737,000
Shipments	181,086,000
Net change in stocks	+3,651,000
Ratio sales to production	98.0%
KEROSENE	
Production	25,987,000
Shipments	25,058,000
Net change in stocks	+929,000
Ratio sales to production	96.4%
STOVE DISTILLATE	
Production	5,118,000
Shipments	5,628,000
Net change in stocks	—510,000
Ratio sales to production	110.0%
GAS OIL	
Production	34,836,000
Shipments	31,182,000
Net change in stocks	+3,654,000
Ratio sales to production	89.5%
FUEL OIL	
Production	142,305,000
Shipments	134,942,000
Net change in stocks	+7,363,000
Ratio sales to production	94.8%

5 Products

under the Skelly banner of quality

NO matter what Skelly product a customer uses, he usually finds himself led to try another . . . then possibly another. And so the use of the Skelly five products enlarges steadily, proving to us it pays to be particular to the point of being "finicky" that no other than highest quality ever appears under the Skelly banner.

See the SKELLY Booth at the Exposition . . .

THESE five major products of Skelly Oil Company are exhibited in an elaborate booth at the International Petroleum Exposition. Make the acquaintance of this entire family of products —and of the Skelly "family" of men and women, also.

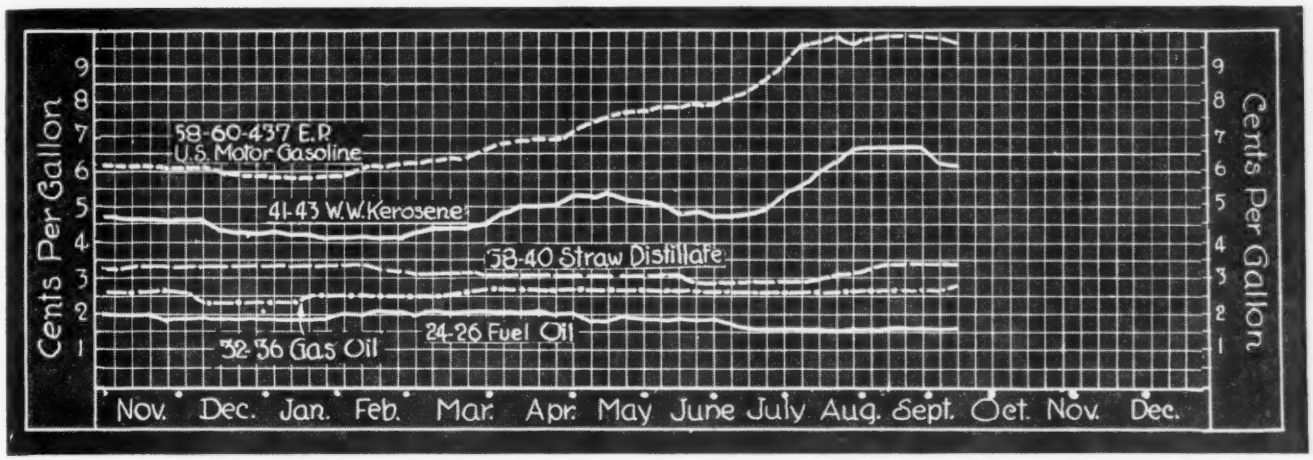
SKELLY OIL COMPANY

General Offices—TULSA

Refinery—EL DORADO, KANS.

Branches—Kansas City, Omaha, Minneapolis

Current Prices of Principal Mid-Continent Refined Products



Prices shown are on Group 3 basis and extended to date shown in Refinery Market Tables Section of this issue

was reported by Oklahoma refiners. Average crude runs at the 29 plants in Oklahoma were 121,722 barrels per day as compared with 106,613 barrels per day the previous week, an increase of 15,000 barrels daily average. Runs in both Kansas and the north Louisiana-Arkansas groups were increased only slightly. As a result of the increase in runs gasoline production in the district increased nearly 2,000,000 gallons to 46,247,000 gallons. The previous week production was down to 44,417,000 gallons. Most of the increase in gasoline production was reported by Oklahoma refiners with Kansas next in line.

Shipments of gasoline were higher than in the first week of the month in spite of the advancing fall season. Total shipments for the week were 44,119,000 gallons as compared with 43,942,000 gallons in the week ended October 5. Gasoline shipments were lower from Kansas and Texas plants, slightly higher in North Louisiana and Arkansas and 600,000 gallons greater in Oklahoma, rising to 19,220,000 gallons in that state.

In the corresponding week last year gasoline shipments totaled 31,102,000 gallons which was a decrease of 4,500,000 gallons from the level reached in the first week of October that year. It will be observed that shipments still are running from 25 to 30 per cent above last year.

Gasoline stocks at all reporting plants totaled 51,464,000 gallons on October 12, an increase of 2,000,000 gallons over October 5. At the current rate of shipments, stocks now represent approximately eight days' supply. On October 14 last year stocks totaled 60,444,000 gallons, nearly 14 days' supply. Kerosene production in the field was not changed during the past week but shipments dropped more than 1,000,000 gallons, causing an increase in stocks of 660,000 gallons to 14,073,000 gallons. Stove distillate demand increased again with the advancing season to 1,693,000 gallons while production was reduced to 975,000 gallons. Stocks were cut 718,000 gallons to 5,410,000 gallons.

Both production and shipments of gas oil were lower, and stocks continued to increase during the week, the rise being 1,200,000 gallons to 59,544,000 gallons.

For the second week in succession fuel oil stocks were reduced slightly. Shipments increased 3,000,000 gallons to 34,511,000 gallons while the larger crude runs brought production up to 34,410,000 gallons. Total stocks on October 12 were 180,244,000 as compared with 104,623,000 gallons a year ago.

Wilcox O. & G. Co. Reopens Bristow Refinery

TULSA, Oct. 13.—The Wilcox Oil & Gas Co., was to reopen its refinery at Bristow on Oct. 15, according to announcement Oct. 13. The plant has been shut down for some months after having been under lease to another company for several years.

To provide crude for operations the company is laying a 4-inch line to its producing properties in the Slick district. This will supplement the present gathering system into the Bristow Poor Farm area. J. J. Keirns is superintendent of the refinery.

The Wilcox plant has a capacity of 1,000 barrels per day. Consideration is being given to plans for enlargement. The company now is building a second large service station in Tulsa at Sixth street and Detroit avenue. It has one large station at Third street and Denver avenue.

ROCHESTER, N. Y.—G. David Burgevin, formerly with the Tide Water Oil Co., New York, is now representative in New York state and in eastern Canada for the Crown Central Petroleum Corp., New York.

Roxana Not to Build Plant At Houston Now

HOUSTON, Oct. 11.—Reports that subsidiaries of the Shell Union Oil Corp. would immediately build a large Houston refinery and supply it with crude from the West Texas fields were denied in a telegram from President U. de B. Daly of Roxana Petroleum Corp. to the Houston office of NATIONAL PETROLEUM NEWS. The reports had credited Roxana with being ready to go ahead with refinery construction and the Shell Pipeline Corp. with plans for construction of another trunk system from West Texas.

The Roxana exercised at the beginning of the present year an option it had previously taken on a 600-acre tract in the Deer Park area, down the Houston ship channel.

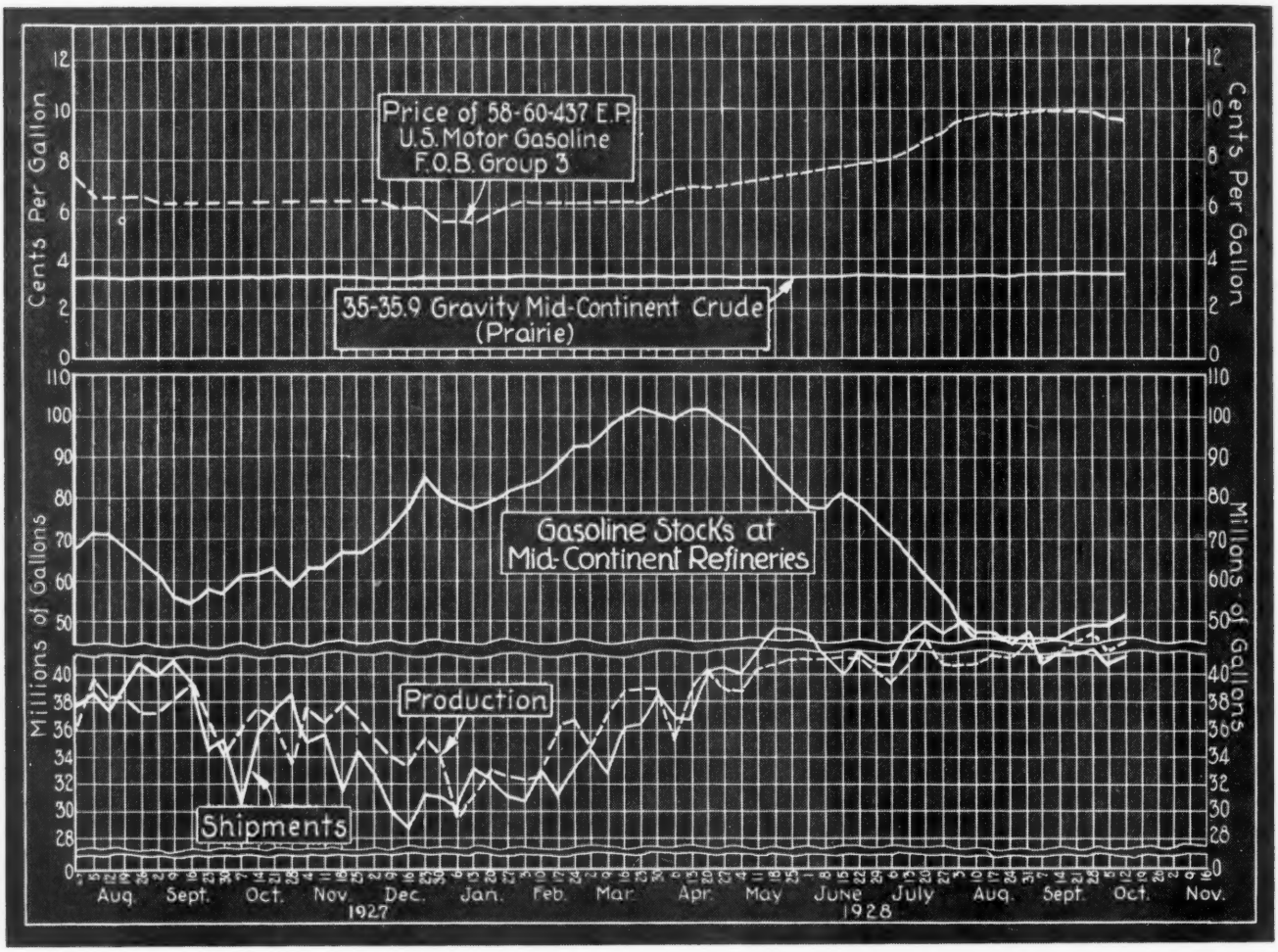
Although the purchase authorization was definitely made for refinery purposes, no plant construction plans were announced at that time. They were believed to hinge on the development of owned production in the Gulf Coastal region rather than for the handling of crude produced in fields of the interior United States.

Later, a preliminary survey for a West Texas-to-Houston transportation system of the affiliated Shell Pipeline Corp. was reported. This again led to reports of refinery construction by the Roxana at Houston.

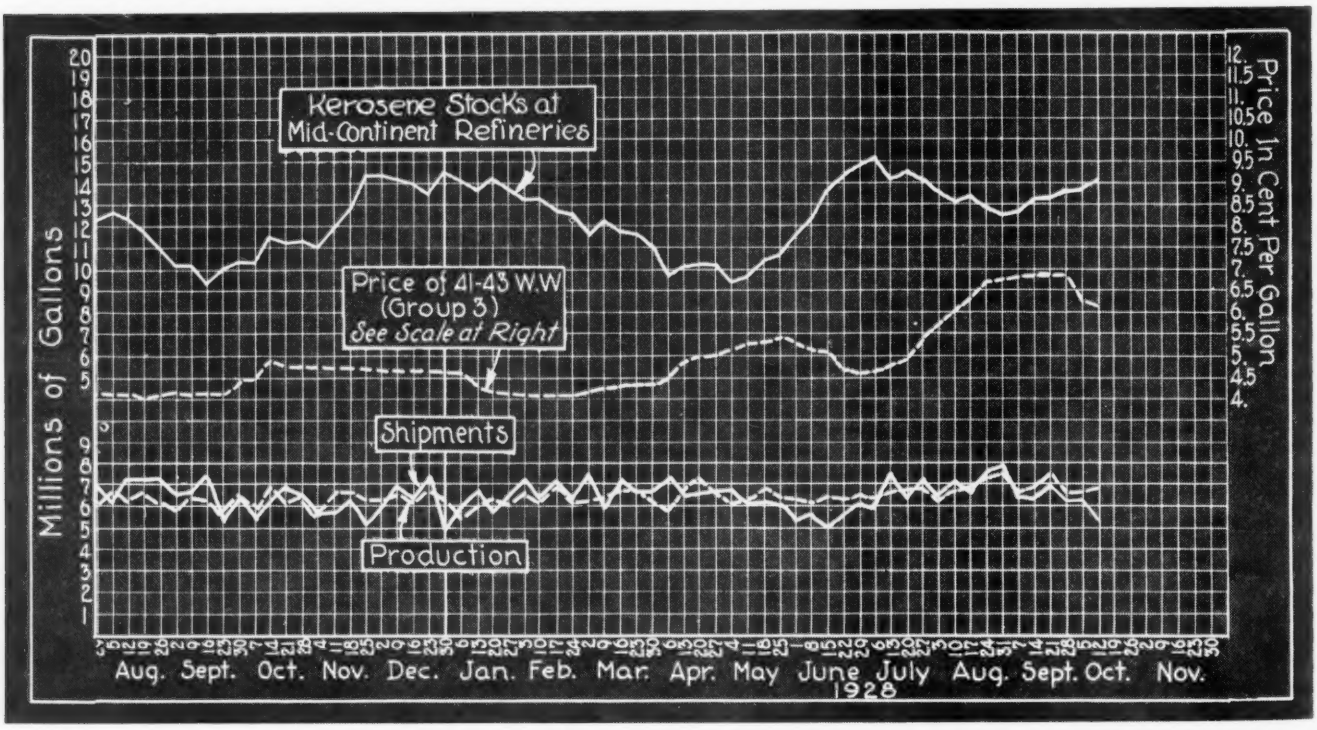
NEW YORK—Frederick G. Clapp, consulting geologist with New York headquarters at 50 Church St., who has been doing petroleum exploratory work for the Imperial Government of Persia, has left Persia and is located with his family in France for the winter. Mr. Clapp can be reached at No. 68 Quai d'Auteuil, Paris XVI, or at his New York office.

Barometer of Mid-Continent Refinery Market—Week Ending October 12

Charted Course of Prices, Production, Shipments, Stocks of Principal Refined Products, Week by Week, From Reports Made by 82 Plants to National Petroleum News


Price of 58-60-437 E.P. U.S. Motor Gasoline F.O.B. Group 3
35-35.9 Gravity Mid-Continent Crude (Prairie)
Cents Per Gallon
Gasoline Stocks at Mid-Continent Refineries
Production
Shipments
Millions of Gallons
Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov.
1927
1928

Prices shown above are extended to date shown in Refinery Market and Crude tables in Market section of this issue and stocks, shipments and Production are extended to date as shown in the table on the opposite page


Kerosene Stocks at Mid-Continent Refineries
Price of 41-43 W.W (Group 3) See Scale at Right
Shipments
Production
Millions of Gallons
Price In Cent Per Gallon
Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov.
1928

Now! your window signs—trademark—lettering in a finer, heavier, more durable product!

New Improvement Over All Former Processes

Meyercord Du-Cal is the *latest and finest* improvement in window-signs, trademarks, pictures or lettering on windows, drums, pumps, barrels—wherever you can use such displays. Anybody can quickly apply it. *Only a dipping in water is necessary.* It saves the time, labor and cost of hand-painting. It excels *every* former process—and endures from two to four times longer than the old-style signs.

TRADE MARK REGISTERED U.S.PAT.OFF.

DU-CAL

A Meyercord Decalcomania Product

The new DU-CAL is made of extra *heavy* films of remarkable brilliance and durability. All oil and lacquer colors are used—in any combination. The coloring is most vivid—has the longest range of visibility—and attention-compelling beauty. Your signs in Meyercord Du-Cal are *lasting* signs. They can be washed over repeatedly without injury. They go readily on glass, steel, wood, leather, rubber, composition—any surface enameled, painted, lacquered, or plain. And they *stay* there—bright and fresh after long hard use.

Meyercord Du-Cal on windows and equipment is your most efficient, most economical advertising.

Meyercord lettering and trademarking on Delivery Trucks, Tank Cars, Salesmen's Cars, Storage Tanks effect savings in money and time and produce exact uniformity of design and colors.

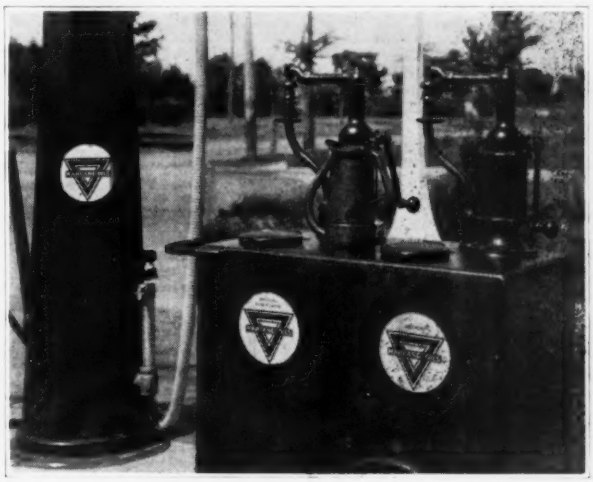
Write today for samples and prices.

THE MEYERCORD CO.

120 South La Salle St., Chicago

Branch offices in all principal cities

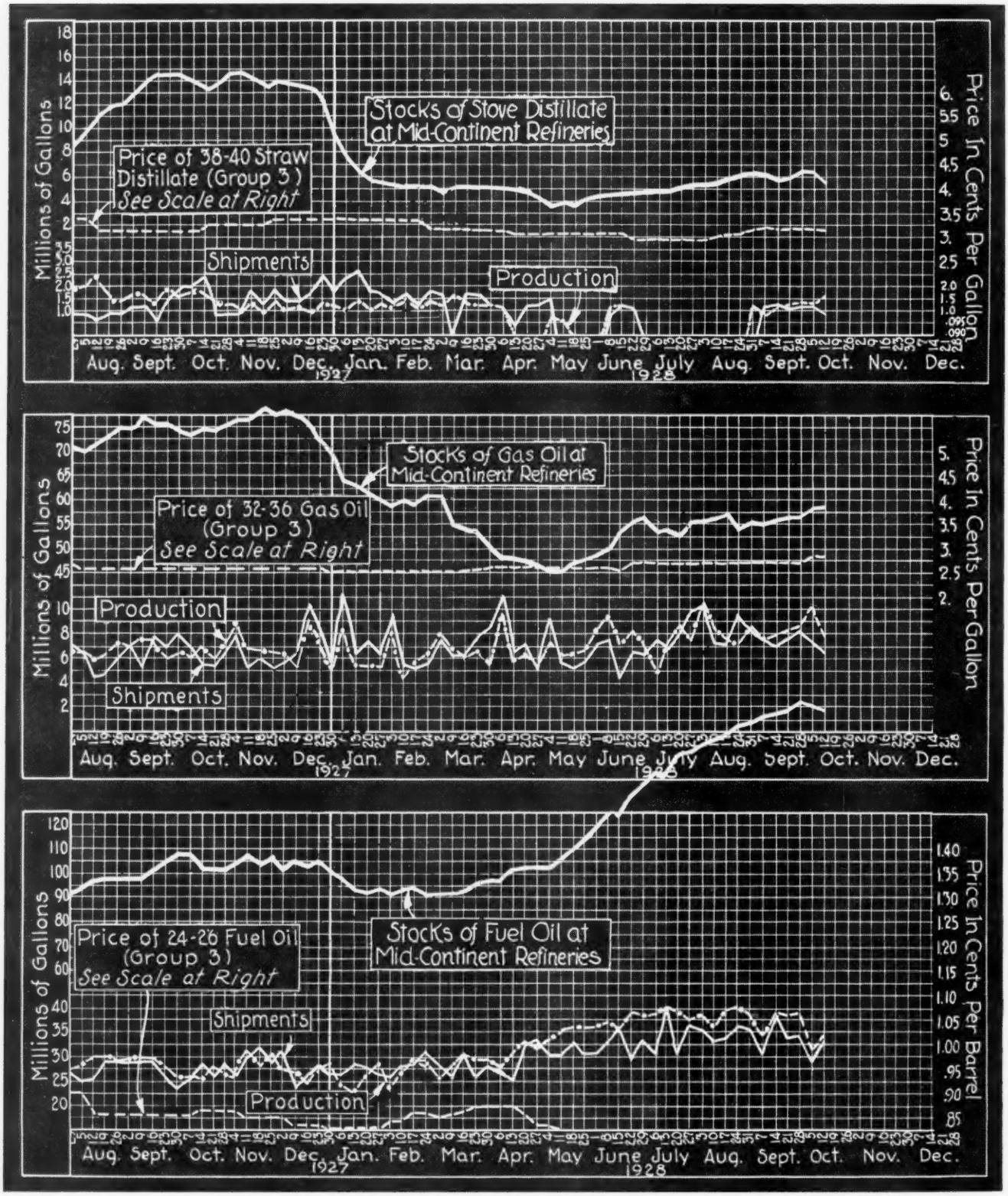
Miniature one color reproduction of two "Du-Cal" signs used on Marland Filling Station windows.



Other applications of "Du-Cal" signs by Marland.

Barometer of Mid-Continent Refinery Market
Week Ending October 12

Charted Course of Prices, Production, Shipments, Stocks of Principal Refined Products, Week by Week, From Reports Made by 32 Plants to National Petroleum News


Millions of Gallons
Price In Cents Per Gallon
Stocks of Stove Distillate at Mid-Continent Refineries
Price of 38-40 Straw Distillate (Group 3) See Scale at Right
Shipments
Production
Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
1927
1928
Millions of Gallons
Price In Cents Per Gallon
Stocks of Gas Oil at Mid-Continent Refineries
Price of 32-36 Gas Oil (Group 3) See Scale at Right
Production
Shipments
Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
1927
1928
Millions of Gallons
Price In Cents Per Barrel
Price of 24-26 Fuel Oil (Group 3) See Scale at Right
Stocks of Fuel Oil at Mid-Continent Refineries
Shipments
Production
Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
1927
1928

Refinery - Tank Wagon Markets

National Petroleum News

Mid-Continent Gasolines Mark Time With Prices Fractionally Lower

Staff Special
TULSA, Oct. 13

THE Mid-Continent gasoline market rode through the second week of the month almost devoid of features. Buying was somewhat lighter and prices were fractionally lower in some spots. One export inquiry was reported but no sale was made.

Kerosenes were in little demand from the domestic trade. Purchase of approximately 750,000 gallons of prime white goods for export was reported in Texas. Prices in all areas lost some ground.

Natural gasolines were not as active as they were late the previous week, but buying was sufficiently good to prevent any accumulation of stocks. Prices eased off fractionally but recovered before the close of the week.

Stove distillates continued in active demand. Gas oil also was moving well with very little low cold test goods available except for contract shipments.

Fuel oils were more actively sought in Oklahoma. Prices were steady. Neutral oils were quiet. Bright stock was scarce at unchanged prices.

Gasolines

A lighter spot demand for gasolines the second week of October was reported from virtually all areas of the Mid-Continent. Contract shipments continued to be at comparatively high levels for this season and with a few exceptions refiners reported they were keeping their production moving sufficiently well to prevent any appreciable amount of gasoline going into storage.

The price structure in Oklahoma has begun to feel the effects of the lower quotations from other areas, but the pressure so far has not been sufficiently strong to cause any break in Group 3.

The better conditions noted late the first week of the month in Arkansas, Louisiana and Texas held sway through Oct. 8 and 9 but by the middle of the week quotations in Arkansas and Louisiana especially were lowered fractionally. The north Texas refiners made virtually no changes in their quotations but more of their goods were being moved in competition with Oklahoma, Louisiana and Arkansas and this situation caused a few Oklahoma refiners to lower their prices slightly to hold their normal business.

A majority of refiners in Oklahoma, however, continued to quote prices unchanged from those of the previous week. At the same time some gasolines which are not of uniform specifications have been moved from Oklahoma at prices considerably under the prevailing quotations. Some of this gasoline is untreated while some does not quite meet the intermediate boiling points required for U. S. Motor gasoline. The bulk of this gasoline is manufactured at small plants which have virtually no storage facilities and must depend strictly on the spot market from day to day to move their output.

There has been much discussion lately as to what effect the west Texas gasoline market will have on the other sections of the Mid-Continent this winter.

Several refiners are of the opinion that the wext Texas refiners will be heavy users of naturals this winter in order to bring their gasolines to a more desirable boiling range for winter fuel, or that many of the large jobbers who are equipped to do their own blending will buy the west Texas gasoline and naturals and make their own high gravity, low boiling range and anti-knock motor fuel for winter consumption.

One export company inquired for some 60-62, 400 end point gasoline in north Texas early in the week, but the offered price of 9.25 cents apparently failed to interest any of the refiners and no sales were reported.

Natural Gasolines

The active buying which raised the prices of natural gasolines late the first week of October, kept the market comparatively steady all this week. There was a slight let-down around Oct. 10, but by the close of business Oct. 13 new inquiries had been of sufficient volume to push prices up again. Grades A and AA have been the most active of the naturals. One buyer said Oct. 13 that he had checked the entire field and had found only one manufacturer who could quote him on more than 10 cars for spot shipment. Most of the manufacturers, he said, had only two to five cars available, and the total volume was comparatively small.

The Humble Oil & Refining Co. which bought the bulk of the goods late last week, was reported to have ordered rush shipments on all contracted goods. The naturals are being used primarily to increase the volatility of the gasolines produced from the west Texas crudes.

Manufacturers read with interest Oct. 12 of the cold wave which was sweeping over much of the Middle West from the Rocky mountains. They anticipate a better demand from refiners who will also begin "spiking" their gasoline for winter consumption.

Kerosenes

Three lots of 25 cars each of 41-43 prime white kerosene for export have been reported sold to north Texas the past 10 days at 5 cents a gallon. The goods are for future delivery, it was reported.

The domestic kerosene market lost ground in all areas. Demand has been very light all week and a few refiners who previously had been quoting 6.375 cents a gallon for 41-43 water white grade, had reduced their prices to 6.25 cents by Oct. 10. Other refiners later reduced their prices to 6 cents, and the prevailing price

◆ *Largest producers of Denatured Alcohol* ◆

U.S. INDUSTRIAL ALCOHOL CO.

Executive Offices: 110 East 42nd Street, New York, N. Y.—Branches in all principal cities

range Oct. 13 was 6 to 6.25 cents in Oklahoma.

Texas refiners were obtaining from 5.75 to 6 cents a gallon for their 41-43 water white grade. Kansas refiners most of the summer have been short of kerosenes, but several reported late in the week they were beginning to accumulate a little surplus. The same report also was received from Louisiana and Arkansas.

An inquiry for high gravity kerosene for export was reported in the field late in the week but no details could be obtained and no purchases had been reported prior to close of business Oct. 13.

Distillates and Gas Oil

No let-up in the active demand for stove distillates was noted. Refiners have enjoyed a good business the past three or four weeks. Buyers have been extremely anxious to obtain low flash, zero cold test goods, and two or three of the refiners making this grade of oil report they are behind with shipments. Prices were generally unchanged.

Zero cold test oils also have been moving well throughout the week. Buyers reported very little of this grade obtainable for spot shipment. Higher cold test gas oils were more freely offered.

Fuel Oils

Oklahoma refiners have been obtaining more fuel oil business this month and report higher gravity oils in better demand. A few refiners who during the summer had to push their fuel oil sales report that now they are having to turn down orders. They anticipate even better demand before the end of the month. Prices were generally steady in all areas.

Neutral Oils and Cylinder Stocks

Demand for neutral oils was lighter in Oklahoma. Some competition has developed from other areas. Prices on one or two grades have been lowered slightly by a few refiners. The majority continued to quote at prices unchanged from last week. Bright stock was in excellent demand with stocks extremely low.

Q.D.A. Missionaries Work Michigan

DETROIT, Oct. 12.—H. H. Ragle and W. A. Garvey, respectively president and secretary of the Michigan Independent Oil Men's association, both were in attendance at the meeting of the American Oil Men's association in Detroit this week. They report an arduous month's work since the announcement of the Standard Oil Co.'s new arrangement under the quantity discount agreement.

For a month they have traveled Michigan, trying to give the Independent jobbers of the state an even start with the rest of the industry, explaining the "in's and out's" of the new contract before it should take effect.

Chicago Resale Market

Good Weather Keeps Gasoline Up

Staff Special
CHICAGO, Oct. 13

GOOD motoring weather through the middle west and resultant heavy gasoline consumption were outstanding features in the week ended Oct. 13. Gasolines were active in the Chicago resale market and while the major portion of the movement was on a contract basis there was also a good call for spot goods.

Most of this spot business has been enjoyed by the marketers, who are holding their spot price approximately .375 cent under the asking price of the major Oklahoma refiners. Refiners report that jobbers are ordering out gasoline to the limit of their contracts and in some cases are buying an occasional car in addition to their contract goods. Most jobbers continued to buy mainly on a hand-to-mouth basis, the trade reported.

Not much change was apparent in gasoline prices throughout the week. The major Oklahoma refiners continued to get 9.75 cents for spot gasoline, while resale agents were moving goods at 9.25 cents up. However, the bulk of the movement was at 9.50 to 9.75 cents Oct. 8 and 9 and at 9.375 to 9.75 cents thereafter. A considerable portion of the gasoline moving under 9.75 cents was coming out of differential points on a Group 3 basis.

The gasoline market in general appeared to be on a steady basis. Resale agents reported few changes in their buying prices over the past week or two and one or two said they found it a trifle harder to buy full specification Oklahoma U. S. Motor under 9.375 cents. Opinion was expressed in one or two quarters that the Pennsylvania crude advance on Oct. 13 might be beneficial in strengthening the Ohio gasoline market and thus help the local situation.

The trade reported the new Q.D.A. being well received in all quarters and practically all sellers living up to it.

Demand for high test gasolines has been rather quiet this week. Most sellers report it too early in the season for any noticeable switch to these grades. Prices were generally unchanged throughout the week.

The 60-62, 437 e.p. gasoline moved all week at 9.625 to 9.875 cents. Gasoline of 60-62, 400 e.p. opened at 9.875 to 10.25 cents and moved at 9.875 to 10.125 cents after Oct. 9. Most sellers were getting 10.625 to 10.875 cents for 64-66, 375 e.p. gasoline.

Kerosene continued to ease off in price as demand was light and goods were more freely offered. Most sellers reported only a normal seasonal demand. The bulk of sales of the 41-43 w.w. grade were at 6 to 6.25 cents most of the week, after opening Oct. 8 at 6.125 to 6.25 cents. A few sales were reported at under 6 cents.

Warm weather of the past week was the reason given by most of the trade for the easing off in demand for furnace oils. Distillate demand continued steady and was receiving the most call of any of the heavy oils. Several of the trade expressed the opinion that householders had their storage tanks well filled and it would be quite a while before they were in the market again.

No changes were apparent in prices. A few refiners were asking up to 3.625 cents for 38-40 straw distillate but the bulk of movement of this commodity was at 3.25 to 3.375 cents.

Gas oils were in fair demand with the zero grades getting the best play. Prices were unchanged over the week. The 32-36 ordinary dark grade moved at 2.50 to 2.625 cents; 32-36 dark zero mostly at 2.75 cents, and 32-36 straw zero moved mostly at 2.875 to 3 cents.

Higher gravities of fuel oil were enjoying a good play, while the heavy grades were sluggish. High sulfur west Texas fuel oils were still freely offered at low prices. No changes were made in prices over last week. The 28-30 zero fuel moved mostly $0.875 to $0.90 and higher cold test goods at $0.825 to $0.85. Fuel of 24-26 gravity was $0.65 to $0.675. Low sulfur 18-22 fuel sold mostly at $0.575 to $0.65 while the high sulfur 19-22 grade was $0.525 to $0.55.

Showers will occur at the beginning and again at the close of next week in Standard of Indiana territory. Rising temperatures will prevail at start of week and becoming cooler at close, says the Chicago weather bureau.

Hendrickson Transferred

TULSA, Oct. 15.—E. J. Hendrickson, plant engineer for the Empire Oil & Refining Co., has been transferred to the Petty Island plant of the Crew-Levick Co., an affiliated company of the Doherty group. He is to be plant engineer at Petty Island.

H. V. Minges has been made plant engineer at the Ponca City plant to succeed Mr. Hendrickson. Mr. Minges has been at the Ponca City plant for a number of years in various capacities.

Refinery Markets on Light Oils and Lubricants

Prices given below are in cents per gallon, F. O. B. refinery, except where $ is shown

(These Refinery Prices compiled in the OIL PRICE HANDBOOK for a whole year)

GASOLINE AND NAPHTHA

PENNSYLVANIA	Prices Oct. 15	Prices Oct. 8	Prices Oct. 1
52-54 Naphtha	10.50 –11.25	10.75 –11.50	11.00 –11.75
54-56 Naphtha	10.75 –11.25	11.00 –11.75	11.00 –11.75
58-60 U.S. Motor 437 e.p.	11.00 –11.75	11.50 –12.00	11.75 –12.25
60-62 400-410 e.p. gasoline	12.00 –12.75	12.00 –12.50	12.25 –13.00
64-66 390 e.p. gasoline	12.50 –13.50	12.75 –13.75	13.50 –14.00
68-70 Str-run gas. 350-360 e.p.	13.50 –14.00	13.50 –15.00	13.50 –15.50
OHIO (Quotation of S. O. Ohio.)			
58-60 U.S.Motor, delivered in Ohio, tax to be added	12.50	12.50	12.50
OKLAHOMA			
48-50 450 e.p. naphtha	†8.75 – 9.00	†9.00 – 9.125	†9.00 – 9.125
50-52 450 e.p. naphtha	†8.75 – 9.00	†9.00 – 9.125	†9.00 – 9.125
56-58 450 e.p. gasoline	9.25 – 9.375	9.25 – 9.50	9.25 – 9.50
58-60 450 e.p. gasoline	9.375– 9.50	9.375– 9.50	9.375– 9.50
64-66 390 e.p. gasoline	10.25 –10.50	10.50 –10.75	10.50 –10.75
68-70 350-360 e.p. gasoline	11.25	11.25	11.25
OKLAHOMA (Weighted Average Prices)			
58-60 U.S. Motor, 437 e.p.	9.7446	9.7426	9.7358
60-62 437 e.p. gasoline	9.8472	10.1042	9.8750
60-62 400 e.p. gasoline	10.2083	10.2500	10.1667
64-66 375 e.p. gasoline	11.0000	11.0000	11.0000

In this issue, all above weighted average prices are effective on Monday on the dates shown at the top of the columns.

KANSAS (F. O. B. refinery Kansas destination)			
58-60 U.S. Motor 437 e.p.	9.75	9.75 – 9.875	9.875
60-62 400 e.p. gasoline	10.25 –10.50	10.25 –10.50	10.50
64-66 375 e.p. gasoline	11.00 –11.125	11.00 –11.125	11.00 –11.125
NORTH TEXAS			
48-52 450 e.p. naphtha	†8.75	†8.75	†8.75
56-58 450 e.p. gasoline	†8.75	†8.75	†8.75
58-60 450 e.p. gasoline	†8.75 – 9.00	†8.75 – 9.00	†8.75 – 9.00
58-60 U.S. Motor 437 e.p.	9.125– 9.25	9.125– 9.25	9.125– 9.25
60-62 400 e.p. gasoline	9.625	9.625	9.625– 9.75
64-66 390 e.p. gasoline	9.75	9.75	10.00
64-66 375 e.p. gasoline	10.00	10.00	10.25
68-70 350-360 e.p. gasoline	10.75	10.75	10.75
NORTH LOUISIANA (N. La., Ark. and Miss. destination)			
58-60 U.S. Motor gasoline	9.50	9.75	9.75
ARKANSAS (Arkansas destination only)			
56-58 450 e.p. gasoline	9.00	9.25	9.25
58-60 450 e.p. gasoline	9.25	9.50	9.50
58-60 U.S. Motor 437 e.p.	9.50	9.75	9.75
‡CALIFORNIA			
54-58 U.S. Motor 437 e.p.	9.00 –12.50	9.00 –12.50	9.00 –12.50
58-61 U.S. Motor 437 e.p.	10.00 –13.50	10.00 –13.50	10.00 –13.50
42-45 Eng. dis. 445-480 e.p.	7.00 – 8.00	7.00 – 8.00	7.00 – 8.00

‡3c tax to be added to California gasoline prices if used in state.

NATURAL GASOLINE

(Note: End point of all grades, not over 375 F. Corrosion test adopted Oct. 1, 1927; A.S.T.M. Method D130-27T; doctor test, July 2, 1928.)

OKLAHOMA			
Grade AA, 80-87.9, 90% Recovery	9.875	9.875–10.00	9.50 – 9.75
Grade A, 72-79.9, 90% Recovery	9.875	9.875–10.00	9.50 – 9.75
Grade BB, 84-92, 85% Recovery	9.50 – 9.625	9.625	9.50 – 9.625
Grade B, 76-83.9, 85% Recovery	9.50 – 9.625	9.625	9.50 – 9.625
Grade C, 80-92, 78% Recovery	9.375	9.25 – 9.375	9.50
NORTH TEXAS (F. O. B. Breckenridge)			
Grade AA, 80-87.9, 90% Recovery	9.875–10.00	9.875–10.00	9.625– 9.75
Grade A, 72-79.9, 90% Recovery	9.875–10.00	9.875–10.00	9.625– 9.75
Grade BB, 84-92, 85% Recovery	9.50 – 9.625	9.625	9.625
Grade B, 76-83.9, 85% Recovery	9.50 – 9.625	9.625	9.625
Grade C, 80-92, 78% Recovery	9.375	9.25 – 9.375	9.50 – 9.625
NORTH LOUISIANA (F. O. B. Monroe District)			
Grade AA	†10.25	†10.25 –10.375	†10.25 –10.375
Grade BB	†10.00	†10.125	†10.00 –10.25
Grade C	†9.75	†10.00	†9.75 –10.00
CALIFORNIA			
75-85, 375-390 e.p. blend	7.00 – 7.50	7.00 – 7.50	7.00 – 7.50

MOTOR FUEL BLENDS

OKLAHOMA			
64-66 Blend 437 e.p.	9.00 – 9.25	9.00 – 9.25	9.25

BURNING OILS

PENNSYLVANIA			
45 w.w. kerosene	7.50 – 8.00	7.50 – 8.00	7.50 – 8.00
46 w.w. kerosene	7.875– 8.50	7.875– 8.50	8.00 – 8.75
47 w.w. kerosene	8.125– 8.875	8.25 – 8.75	8.25 – 9.00
300 mineral seal	7.25 – 7.75	7.25 – 7.75	7.50

OKLAHOMA	Prices Oct. 15	Prices Oct. 8	Prices Oct. 1
41-43 w.w. kerosene	6.00 – 6.25	6.125– 6.375	6.25 – 6.50
42-44 w.w. kerosene	6.75	6.75	6.75 – 7.00
KANSAS (F. O. B. refinery Kansas destination)			
41-43 w.w. kerosene	6.75	6.75	6.875– 7.00
42-44 w.w. kerosene	7.00	7.00	7.25
NORTH TEXAS			
40-42 w.w. kerosene	5.625– 5.75	5.625– 5.75	5.75 – 5.875
41-43 w.w. kerosene	5.75 – 6.00	5.75 – 6.00	5.875– 6.00
NORTH LOUISIANA (N. La., Ark. and Miss. destination)			
41-43 w.w. kerosene	7.00	7.00	7.00
ARKANSAS (Arkansas destination only)			
42-44 kerosene	7.00 – 7.25	7.00 – 7.25	7.25
CALIFORNIA			
38-40 w.w. kerosene	6.25 – 7.00	6.25 – 7.00	6.00 – 6.50

NEUTRAL OIL

PENNSYLVANIA Vis.		(Viscosity at 70°F.)	
200 No. 3 Assoc. Filt.	28.50 –31.00	29.00 –31.00	30.00 –32.00
180 No. 3 Assoc. Filt.	26.00 –29.00	26.75 –29.50	27.00 –29.00
150 No. 3 Assoc. Filt.	22.00 –25.00	22.00 –25.00	23.50 –25.00
	(Non Viscous)		
34 Grav. 330-340 Flash	7.50 – 8.00	7.75 – 9.00	7.50 – 8.00
36 Min. Neut., 300-305 Flash	6.75 – 7.75	6.75 – 8.50	6.75 – 8.50
****OKLAHOMA** Vis. Color		(Viscosity at 100°F.)	
100—No. 2	6.00 – 6.50	6.00 – 6.50	6.00 – 6.50
150—No. 3	8.00 – 8.50	8.00 – 8.50	8.00 – 8.50
150—No. 4	8.00 – 8.50	8.00 – 8.50	8.00 – 8.50
180—No. 3	9.00 –10.00	9.00 –10.00	9.00 –10.00
180—No. 4	9.50 – 9.75	9.50 – 9.75	9.50 – 9.75
180—No. 5	9.25 – 9.75	9.25 – 9.75	9.25 – 9.75
200—No. 3	9.50 –11.00	9.625–11.00	9.625–11.00
200—No. 4	9.50 –10.75	9.50 –10.75	9.50 –10.75
200—No. 5	8.50 –10.00	8.50 –10.00	8.50 –10.00
220—No. 3	12.50 –13.50	12.50 –13.50	12.50 –13.50
220—No. 4	12.25 –12.50	12.25 –12.50	12.25 –12.50
220—No. 5	11.50 –12.00	11.50 –12.00	11.50 –12.00
240—No. 3	13.50 –14.00	13.50 –14.00	13.50 –14.00
240—No. 4	13.25 –13.50	13.25 –13.50	13.25 –13.50
240—No. 5	12.00 –13.00	12.00 –13.00	12.00 –13.00
280—No. 3	15.50 –16.50	15.50 –16.50	15.50 –16.50
280—No. 4	15.25	15.25	15.25
280—No. 5	14.00 –15.00	14.00 –15.00	14.00 –15.00
300—No. 5-6	17.00	17.00	17.00
GULF COASTAL Vis. Color		(Viscosity at 100°F., pour test 0)	
100—No. 2 Unfilt. Pale	7.00 – 7.50	7.00 – 7.50	7.00 – 7.50
200—No. 3 Unfilt. Pale	10.00 –10.75	10.00 –10.75	10.00 –10.75
300—No. 3 Unfilt. Pale	11.00 –11.75	11.00 –11.75	11.00 –11.75
500—No. 3½ Unfilt. Pale	12.50 –13.50	12.50 –13.50	12.50 –13.50
750—No. 4 Unfilt. Pale	15.50 –16.00	15.50 –16.00	15.50 –16.00
200—No. 5½ Red Oil	8.25 – 8.75	8.25 – 8.75	8.25 – 8.75
300—No. 5½ Red Oil	9.00 – 9.75	9.00 – 9.75	9.00 – 9.75
500—No. 6 Red Oil	10.50 –11.25	10.50 –11.25	10.50 –11.25
750—No. 6 Red Oil	13.50 –14.00	13.50 –14.00	13.50 –14.00
CALIFORNIA Vis. Color		(Viscosity at 100°F.)	
100—No. 3	9.75 –10.00	9.75 –10.00	9.75 –10.00
200—No. 3	11.50 –12.00	11.50 –12.00	11.50 –12.00
300—No. 3	13.00 –13.50	13.00 –13.50	13.00 –13.50
450—No. 3	15.50 –16.00	15.50 –16.00	15.50 –16.00
550—No. 3	16.50 –17.00	16.50 –17.00	16.50 –17.00
600—No. 3	17.00 –17.50	17.00 –17.50	17.00 –17.50
200—No. 5	11.00 –11.50	11.00 –11.50	11.00 –11.50
300—No. 5	12.00 –12.50	12.00 –12.50	12.00 –12.50
400—No. 5	14.00 –14.50	14.00 –14.50	14.00 –14.50
500—No. 5	15.00 –15.50	15.00 –15.50	15.00 –15.50
600—No. 5	16.00 –16.50	16.00 –16.50	16.00 –16.50
700—No. 7	18.00 –18.50	18.00 –18.50	18.00 –18.50

CYLINDER STOCKS

**OKLAHOMA			
190-200 Vis.at 210° Brt. St.	31.00 –32.00	31.00 –32.00	31.00 –32.00
150-160 Vis.at 210° Brt. St.	26.00	26.00	26.00
600 E. St. 140-150 Vis.-210°	17.00 –18.00	17.00 –18.00	17.00 –18.00
600 St. Ref. Olive Green	8.00 –10.00	8.00 –10.00	8.00 –10.00
600 St. Ref. Dark Green	6.00 – 8.00	6.00 – 8.00	6.00 – 8.00
Black Oil	5.00	5.00	5.00
PENNSYLVANIA		(1-inch Immersion Test)	
600 Steam Refined	13.50 –14.50	13.50 –14.50	13.50 –14.50
650 Steam Refined	15.00 –16.50	15.00 –16.50	15.00 –16.50
600 Flash	18.50 –19.00	18.50 –19.00	18.50 –19.00
625 Flash	26.50 –29.00	28.50 –29.00	28.50 –29.00
600 Warren E	18.50 –19.50	19.50 –20.00	19.50 –20.00
600 Oil City E	17.00 –18.50	17.00 –17.75	17.00 –17.50
600 D Filtered	24.00 –24.50	24.00 –24.50	24.00 –24.50
Cold Test Stock, 40-50p. p., 140-150 vis. at 210° 540-550 flash, No. 8 color	35.50 –36.00	36.00	36 00 –37.00
40-50 p.p., 140-150 vis. at 210°, 540-550 flash, No. 6-6½ color diluted	33.50 –34.00	34.00	34.00 –35.00

†Prices nominal ††Only one refiner quoting *Quotations only

**Represents both sales and quotations

Mr. Brown and Mr. Jones both ride with ETHYL

but for entirely different reasons!

MR. BROWN is a thrifty soul. He knows exactly what it costs him to run his automobile. He can give you the cost per mile of tires, oil, gas and depreciation.

"I use Ethyl Gasoline for economy," says Mr. Brown. "Ethyl costs me about $1.50 more a month—but I don't have to clean out carbon. And that's a big saving. Ethyl keeps out the knock that wears and tears an engine. Then with Ethyl I get more of the power from every gallon of fuel that I use—and that appeals to me too. Besides getting the advantages of a premium fuel, I find that Ethyl actually saves me money."

EVERY day more Mr. Browns and more Mr. Joneses are meeting at Ethyl pumps. (So are their wives). In fact, at hundreds of gasoline service stations, the sales of Ethyl Gasoline now exceed the sales of ordinary gasoline. For there is nothing else like Ethyl. It is good gasoline plus ETHYL "anti-knock" compound, a product of General Motors Research Laboratories. Try it.

MR. JONES doesn't care so much about costs. He drives for pleasure. He wants power, pick-up, smoothness most of all.

"I use Ethyl," says Mr. Jones, "because it makes my car run better than it will on ordinary gasoline. It gives me high compression performance as carbon forms. It keeps me in high when the other fellow has to shift. Give me Ethyl every time! What's a mere $1.50 more a month for gas when I get a hundred dollars' worth of driving satisfaction!"

* * * *

Ethyl Gasoline is colored red for identification only. It's the tetraethyl lead in Ethyl that "knocks out that 'knock.'"

A booklet giving the facts about Ethyl Gasoline will be sent on request.

ETHYL GASOLINE

ETHYL GASOLINE CORPORATION 25 Broadway, New York City 56 Church Street, Toronto, Canada 32, Queen Anne's Gate, London, England

Refinery Markets on Wax and Heavy Oil Products

Prices given below are in cents per gallon, F. O. B. refinery, except where $ is shown

(For quick reference to Refinery Prices, get the OIL PRICE HANDBOOK, published annually)

WAX

PENNSYLVANIA	Prices Oct. 15	Prices Oct. 8	Prices Oct. 1
Per pound, New York			
122-124 white crude scale	5.25 – 5.50	5.25 – 5.75	5.375– 5.75
124-126 white crude scale	5.50	5.50	5.50 – 5.75
OKLAHOMA			
**124-126 White Crude Scale	5.125– 5.25	5.125– 5.25	5.00 – 5.25
CALIFORNIA			
White crude scale, per pound, ton lots	6.00 – 6.50	6.00 – 6.50	6.00 – 6.50

FUEL OIL

PENNSYLVANIA			
36-40 fuel oil	4.50 – 5.00	4.50 – 4.75	4.50 – 4.75
30-34 fuel oil	4.25 – 4.375	4.25 – 4.375	4.25 – 4.375
28-32 fuel oil	4.25 – 4.375	4.125– 4.25	4.125– 4.25
OKLAHOMA			
38-40 straw distillate	3.25 – 3.50	3.25 – 3.50	3.25 – 3.375
36-38 straw distillate	3.125– 3.25	3.125– 3.25	3.00 – 3.125
32-36 gas oil, straw	†2.625– 2.875	†2.75 – 2.875	†2.625– 2.75
32-36 dark gas oil	2.50 – 2.75	2.50 – 2.75	2.375– 2.50
28-30 fuel oil (in bbls.)	$0.85 – 0.90	$0.85 – 0.90	$0.85 – 0.875
26-28 fuel oil (in bbls.)	$0.675– 0.725	$0.675– 0.725	$0.675– 0.725
24-26 fuel oil (in bbls.)	$0.65 – 0.675	$0.65 – 0.675	$0.65 – 0.675
22-26 fuel oil (in bbls.)	$0.575– 0.625	$0.575– 0.625	$0.575– 0.625
18-22 fuel oil (in bbls.)	$0.575– 0.60	$0.575– 0.60	$0.55 – 0.60
16-18 fuel oil (in bbls.)	$0.55	$0.55	$0.55
14-16 fuel oil (in bbls.)	$0.55	$0.55	$0.55
KANSAS (F. O. B. refinery Kansas destination)			
38-40 straw distillate	3.50 – 3.625	3.50 – 3.625	3.50 – 3.625
36-38 straw distillate	3.25 – 3.375	3.25 – 3.375	3.25 – 3.375
32-36 gas oil	2.75 – 2.875	2.75 – 2.875	2.75 – 2.875
24-26 fuel oil	*$0.75 – 0.80	*$0.75 – 0.80	*$0.75 – 0.80
18-22 fuel oil	*$0.70	*$0.70	*$0.70
NORTH TEXAS			
38-40 straw distillate	3.25 – 3.375	3.125– 3.375	3.125– 3.375
32-36 gas oil, cracked	2.375– 2.50	2.375– 2.50	2.375– 2.50
32-36 St. reduced gas oil	2.375– 2.50	2.375– 2.50	2.375– 2.50
24-26 fuel oil (in bbls.)	$0.55 – 0.575	$0.55 – 0.575	$0.55 – 0.575

GULF COASTAL	Prices Oct. 15	Prices Oct. 8	Prices Oct. 1
Fuel (in bbls.)	$1.20 –$1.25	$1.20 –$1.25	$1.20 –$1.25
Gas oil	4.375– 4.50	4.375– 4.50	4.375– 4.50
NORTH LOUISIANA (N. La., Ark. and Miss. destination)			
32-36 gas oil, dark	3.00	2.75 – 3.00	2.75 – 3.00
32-36 gas oil, straw	3.00 – 3.25	2.875– 3.125	2.875– 3.125
16-20 fuel oil (in bbls.)	$0.70	$0.70	$0.70
ARKANSAS (Arkansas destination only)			
32-36 gas oil, straw	3.00 – 3.25	3.00 – 3.25	3.00 – 3.25
32-36 gas oil	3.00	3.00	2.75 – 3.00
28-32 gas oil	2.75	2.75	2.75
CALIFORNIA (F. O. B. San Joaquin Valley. At San Francisco, 4c per bbl. more)			
14-18 fuel oil (per bbl.)	$0.65 –$0.70	$0.65 –$0.70	$0.65 –$0.70
14-18 Bunker oil (per bbl.)	$0.75 –$1.00	$0.75 –$1.00	$0.80 –$1.00
30-34 gas oil (per bbl.)	$1.00 –$1.20	$1.00 –$1.20	$1.00 –$1.20
27 Plus Diesel oil (per bbl.)	$0.90 –$1.00	$0.90 –$1.00	$0.90 –$1.00

PETROLATUMS

PENNSYLVANIA (In barrels, carload lots, f.o.b. refinery. In tank cars 5/8c to 3/4c per pound less.) Quotations of only one refiner on all grades except red petrolatum which is quoted by two refiners.

Snow White	8.625	8.625	8.625
Lily White	7.625	7.625	7.625
Cream White	6.625	6.625	6.625
Light Amber	3.625	3.625	3.625
Amber	3.375	3.375	3.375
Red	2.375– 3.125	2.375– 3.125	2.375– 3.125

PETROLEUM COKE

****OKLAHOMA**

(Per ton in car lots)

Lump	$4.50 –$5.00	$4.50 – 5.00	$4.50 – 5.00
Still run	$3.00	$3.00	$3.00
Breeze	$2.00	$2.00	$2.00

†Prices Nominal ††Only One Refiner Quoting *Quotations only **Represents Both Sales and Quotations

California Refinery Market

Domestic Prices Up; Exports Down

Staff Special

LOS ANGELES, Oct. 13

EXPORT gasoline in California was slightly lower this week, although for shipment within the state it was stronger. There were, however, no actual changes in prices.

U. S. Motor for export was being held at 8.25 cents up, in sympathy with new prices ruling at the Gulf. Lower end point products were off in proportion. Tanker rates continue around 70 cents to East Coast and with U. S. Motor selling at 11.25 cents in New York territory, buyers are gaging their offers to fit the situation.

Gasoline to points within the state holds firm at 10 cents for the lowest offer, ranging up to 12.50 cents, without tax. Most of the bigger refiners hold out for the higher figure. Shipment to points outside California is a different story. Quotations are based on conditions governed by competition from other refining areas. Goods moving in this trade range from 9 cents up about 10 cents at more favorable points.

Natural gasoline continues plentiful, but the manufacturers are holding fairly firm to 7 to 7.50 cents for spot sales. One refiner this week was reported to be selling some natural at 6.50 cents, but this was brought about by an oversupply. This product sold under term contracts ranges around 7 cents, net to the manufacturer.

There is no change in fuel oil market, with previous quotations standing. This product moves in tank cars at 65 to 70 cents, and this movement is expected to show a slight increase in the next 60 days on account of increased consumption, but it is doubted if there will be much improvement in the price, due to present large stocks and heavy production.

Some of the refiners, moving considerable gasoline, may need help in holding down their fuel storage. The Japanese government purchased some high grade fuel (about Grade B) recently to move over a short period at 78 cents. It is also understood that the Japs contracted for some crude. Fuel oil for export continues to hold around 70 cents and up.

Very little gas oil is moving or offered for sale, as this product is scarce. There is no change in kerosene prices, and other products are without change.

* * *

LOS ANGELES, Oct. 11.—Petroleum shipments leaving Los Angeles harbor for points outside of Pacific Coast trade territory during September reached total of 4,314,883 barrels, or a daily average of 143,829 barrels.

Total movement included 350,663 barrels of crude, 1,265,062 barrels of fuel, 1,952,096 barrels of gasoline, 489,308 barrels of kerosene, 79,333 barrels of distillate and 178,421 barrels of diesel.

Products shipped to Pacific foreign included 251,820 barrels of crude, 1,205,958 barrels of fuel, 284,966 barrels of gasoline, 489,308 barrels of kerosene and 178,421 barrels of diesel. Atlantic domestic points drew 98,843 barrels of crude, 1,030,618 barrels of gasoline and 79,333 barrels of distillate. Remainder of movement went to Atlantic foreign points.

Pennsylvania Refinery Market

Cylinder Stocks Active

CLEVELAND, Oct. 13.—The Oct. 13 advance of 10 cents a barrel in price of Pennsylvania crude oil had little effect on the Pennsylvania refinery market today. Some refiners expected a few price revisions next week because of the advance.

Demand for cylinder stocks continued good with prices holding up well. The peak season for bright stocks has passed but most manufacturers were holding the light stocks for 36 cents.

Colder weather is expected to bring a more active demand for neutrals. Refiners believe this expected demand has halted the downward trend of neutral prices which has been evident the last several weeks.

Many refiners are still sold up on paraffin wax. Prices were steadier this week than recently. Refiners attributed the recent low prices in the New York market to "wash sales" among wax brokers to bear the price at the source of supply. They pointed to the Bureau of Mines statistics which showed the supply of wax on hand Aug. 31 to have been the smallest in 10 years, as evidence that a falling wax market is unwarranted at this time.

Gasoline was quieter and prices were down 0.25 cent from a week ago. Kerosene and fuel oils were generally steady.

Wayne Buys Los Angeles Equipment Company

FORT WAYNE, Ind., Oct. 12.—The Wayne Co., of Fort Wayne, has bought the Boyle Dayton Co. of Los Angeles, manufacturer of gasoline service station equipment including pumps and tanks. The consideration is reported to be in the neighborhood of $1,000,000. No new financing is contemplated, it was announced.

The deal was concluded Oct. 8 in Los Angeles by William M. Griffin, president of the Wayne Co.

B. F. Geyer, vice-president and general manager of the Wayne Co., announced here that the factory of the Boyle Dayton Co. in Los Angeles will be continued and used also as a distributing point for Wayne products on the Pacific coast, the Orient, Hawaii and Australia. The Wayne and Boyle Dayton distributing organizations on the Pacific coast will be consolidated.

A. D. Carriger, vice-president and director of sales, and E. A. Zern, treasurer of the Wayne Co., have gone to Los Angeles to assist in reorganizing the new property to fit the Wayne organization.

Wax Market

Demand Turns Upward

NEW YORK, Oct. 13.—Export wax markets turned for the better late this week with a resumption of active inquiry from abroad. Foreign demand, long anticipated, apparently came at the crucial moment relieving the market of distress offers which had begun to grow in volume.

Toward the end of the week, white crude scale at 4.875 cents a pound was no longer a market factor. Small lots of both 122-124 and 124-126 A.m.p. goods sold Monday and Tuesday at this price. As the week advanced bids at this price became more liberal and sellers accordingly advanced their quotations. According to well informed sources buyers bidding this figure Saturday were unsuccessful in securing even small lots and only a limited volume of goods was offered at 5 cents. Most sellers were asking 0.125 to 0.25-cent higher.

The Bureau of Mines figures for August, which showed wax stocks in the United States at a new low of 79,000,000 pounds, also gave rise to further bullishness. Predictions of 6-cent scale before the end of the year were again heard in more than a few quarters.

Fully refined waxes held firm, the lower melting points advancing 0.125-cent on the elimination of distress stuff from the market. A much more spirited demand for fully refined waxes was reported from South American buyers.

Gulf Coast Lube Demand Gains

HOUSTON, Oct. 15.—Increased business in October over September is reported by Gulf Coastal lubricant manufacturers. All grades from 200 viscosity upward are in demand by jobbers. Although prices are unchanged over Oct. 8, they are reported showing firmer tendencies.

To Install Cracking Plant

TULSA, Oct. 15.—The Illinois Oil Co. is planning to install a cracking plant this winter in connection with its refinery at Cushing, it was announced today by F. P. Welch, president. Engineers have not determined which process is to be built. The company has done a great deal of work at the plant in recent months bringing it up to modern standards.

PHILADELPHIA, Oct. 13.—C. A. Boler has resigned as president of the Tiona Petroleum Co., marketing and exporting company with headquarters here, to enter the export business on his own account. The board of directors Oct. 10 elected S. P. Worthington president to succeed Mr. Boler. Mr. Worthington has been secretary of the company.

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MOTOR OIL
White Rose
GASOLINE

YOU will make money if you handle these nationally advertised brands.

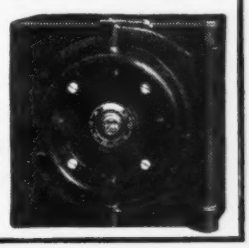
All grades of lubricating oils and greases.

The National Refining Co.
Cleveland, Ohio

Cash that can be stolen is a magnet!

It draws the burglar and hold-up man just as irresistibly as the loadstone draws steel filings.
The York Burglary Chest—the result of nearly half a century in expert safe construction—will bring to your service station the protection needed.

York Safes



YORK SAFE and LOCK COMPANY
York, Pa.

Gulf Export Market

French Buy Gasoline and Kerosene

Staff Special
NEW YORK, Oct. 13

GASOLINE prices ruled substantially lower at the Gulf the last week although French buyers came through with some large purchases. Transactions involving well over 200,000 barrels of gasoline and kerosene were closed and stimulated considerable interest in the market.

Gasolines sold from 0.75 to 1 cent under the last paid prices. Kerosene, in keeping with the firm positions maintained by suppliers of this commodity for some time past, sold at 7.75 cents, which was the last paid, with indications of higher prices in the offing.

Despite the lower gasoline prices, what could be called a decidedly pessimistic tone was absent. Several suppliers were inclined to explain the sharp recessions as merely an adjustment of prices to levels prevailing in California. Prices on the west coast still are a shade under the Gulf but not sufficient to be as attractive to the foreign buyer as they were a month ago.

It was reported that French buyers had threatened to place more business with California refiners should Gulf prices continue proportionately high. A number of the trade discounted this threat, however, in view of the urgency with which they were seeking their requirements. It was doubted if they could wait as long as they would have to for shipments from the Pacific coast.

The fact remains, however, that Gulf suppliers were loath to see any more foreign business slip away from them and accordingly prices were reduced to meet the California competition whether it existed in fact or belief. Sales were consummated only after a great deal of dickering back and forth about prices.

The first cargo, one consisting of half and half of approximately 50,000 barrels of U. S. Motor gasoline and water white kerosene, was closed Oct. 10 with the former selling at 9.25 cents and the latter at 7.75 cents. Loading is scheduled for sometime between Oct. 25 and Nov. 25.

The same price, 9.25 cents, was paid for a small lot U. S. Motor in a transaction closed the following day. The bulk of this cargo, totaling approximately 50,000 barrels, is to consist of 64-66, 375 end point gasoline which sold at 10.875 cents. This business was taken by a leading Independent refiner and is for loading either late this month or early in November.

Two 50,000-barrel mixed cargoes closed Friday were both negotiated by a Philadelphia refiner. One cargo purchased by the leading Independent buyer in the French market is to consist half and half of 64-66, 375 end point gasoline and water white kerosene. This business took 10.875 cents and 7.75 cents, respectively, and is for Oct. 25-Nov. 25 loading.

A new low for U. S. Motor gasoline on the present move was established in the second transaction. This grade sold at 9.125 cents and the 64-66, 375 end point grade at 10.875 cents.

Several other inquiries were circulated among the trade but most of them were either withdrawn or postponed. The inquiry for a part cargo of 64-66, 375 end point remained in the market. Indications Saturday were that active buying would continue next week. Stocks of water white kerosene at the Gulf were asserted to be extremely low and higher prices are anticipated for this commodity.

There was little interest evidenced in the market for fuel oils and prices were generally unchanged. Cargoes of grade C bunker oil continued to be offered at around $0.65 to $0.70 a barrel. Bunker prices were unchanged at $0.85 to $0.90 a barrel.

A broker was negotiating the sale of a cargo of heavy Panuco which he was offering at $0.90 a barrel, f.o.b. Tampico, which is 5 cents under the last paid price. Bunkers were unchanged at $1.05 a barrel in the Tampico district.

New York Domestic Market

Weather Enlivens Gasoline Trade

Staff Special
NEW YORK, Oct. 13

BACKED up by excellent motoring weather and lower prices jobber buying in eastern gasoline markets were more active the week ended Oct. 13. Temperatures along the Atlantic seaboard soared to abnormal heights for the season early in the week and remained there for the most part up through Saturday.

In view of the easier tone the market had displayed the last two weeks, buyers who had covered their October gasoline requirements were comparatively few. Most of them had been content to purchase on a hand-to-mouth basis. The result was a revival of interest in the spot market such as has been experienced but few times before this year.

To most automobile owners in the metropolitan districts Columbus Day, Oct. 12, was a holiday. Daily newspapers Saturday told of traffic congestion in suburban and rural districts. All of which seemed to give new life to gasoline markets. The effect of holiday consumption will show up next week, the trade believes, with continued good demand for spot shipment.

Price ranges narrowed considerably this week with general recessions from the high levels which most of the major companies had been maintaining. Lower prices apparently had little of a depressing effect on sellers, however. Seasonal price reductions were to be expected, they said, although the market had begun to slide back a little sooner than they had expected.

The upward trend in kerosene prices doubtless will keep gasoline from going appreciably lower. Unless, however, an unprecedented situation of kerosene selling higher than gasoline were to materialize. The consensus of the trade was there was little likelihood of this condition developing, but at the same time the buoyancy of the kerosene market was cited as a factor which doubtless would serve to bolster gasoline prices to a large extent.

The market for U. S. Motor gasoline at New York harbor opened Monday with goods freely available at 11.25 cents but with the majority of large sellers still quoting 11.75 cents. Occasional small lots were reported sold at the latter figure. A leading refining company reduced its price to 11.25 cents as of Oct. 9 with most of the other large companies meeting the reduction the following day.

At least three important factors in the New York harbor market were offering U. S. Motor at 11 cents toward the end of the week with the result that New York stood 0.25-cent under other seaboard districts. One company showed a representative of NATIONAL PETROLEUM NEWS orders for between 65 and 70 cars of U. S. Motor at 11 cents, all of which specified prompt delivery. This company

(*Continued on Page* 228)

Complete Seaboard Market

(Export markets for whole year given in OIL PRICE HANDBOOK. Each volume carries refinery, tank wagon, crude and export markets—complete for the whole year)

Eastern Domestic Market

(Prices for tank car lots, f. o. b. refinery or seaboard terminal, representing majority of quotations.)

U. S. MOTOR GASOLINE	Oct. 15	Oct. 8	Oct. 1
New York harbor	11.00 –11.25	11.25 –11.75	11.25 –11.75
Portland district	†12.25 –12.75	†12.25 –12.75	†12.25 –12.75
Boston district	*12.25	*12.25	*12.25
Providence district	*11.75 –12.25	*12.25	*12.25
Philadelphia district	11.25	11.25 –11.50	11.50
Baltimore district	11.25	11.50 –11.75	11.75
Norfolk district	11.25	11.50 –11.75	11.75
Charleston district	11.25	11.25 –11.50	11.50
Savannah district	11.00	11.00 –11.25	11.25
Jacksonville district	11.00	11.00	11.00 –11.25
CALIFORNIA U. S. MOTOR GASOLINE			
New York harbor	11.25	11.25 –11.50	11.75
Philadelphia district	11.25	11.25	11.50
Baltimore district	11.25	11.50	11.75
WATER WHITE KEROSENE			
New York harbor	9.00	9.00	8.50
Philadelphia district	9.00	9.00	9.00
Baltimore district	9.00	9.00	8.50
GAS OIL: 28-34 Gravity			
New York harbor	4.75 – 5.00	4.75 – 5.00	4.75 – 5.00
Boston district	4.75	4.75	4.75 – 5.00
FURNACE OIL: 36-40 Gravity			
New York harbor	6.50	6.00 – 6.25	6.00 – 6.25
Boston district	6.25 – 6.50	6.00 – 6.25	6.00 – 6.25
GRADE C BUNKER OIL			
New York harbor	$1.05	$1.05	$1.05
Boston district	$1.05	$1.05	$1.05
DIESEL OIL			
New York harbor	$2.00	$2.00	$2.00
MEDICINAL OILS, RUSSIAN			
885-890 s.g., 325-330 vis.	$0.80 – 0.90	$0.80 – 0.90	$0.80 – 0.90
870-875 s.g., 150-155 vis.	$0.67 – 0.77	$0.67 – 0.77	$0.67 – 0.77
860-865 s.g., 80-85 vis.	$0.65 – 0.75	$0.65 – 0.75	$0.65 – 0.75

Note: Above prices do not include inspection tax levied in some states.
*13 to 13.50 cents delivered.
†13.50 to 14 cents delivered.

New York Export Market

(Gasoline and kerosene in cases in bulk. Lubricating oils are per gal. in bbls. Cylinder oils are Penna. products)

	Oct. 15	Oct. 8	Oct. 1
U. S. Motor gasoline	26.90	26.90	26.90
43-45 150 w.w. kerosene	18.90	18.90	18.65
42-44 110 s.w. kerosene	17.65	17.65	17.40
CYLINDER OILS			
Bright stock, dark	44.00	44.00	43.00 –44.00
600 D filtered	31.00 –32.00	31.00 –32.00	30.00 –32.00
600 Warren E filtered	26.00 –27.00	26.00 –27.00	26.00 –27.00
600 s.r. unfiltered	21.00 –22.00	21.00 –22.00	20.00 –21.00
650 s.r. unfiltered	22.50 –24.00	22.50 –24.00	22.50 –24.00
600 flash, s.r.	26.00 –26.50	26.00 –26.50	26.00
630 flash, s.r.	36.00	36.00	35.00 –36.00
RED ENGINE OILS (Vis. 100°)			
300 vis. No. 6½ color	19.50	19.50	19.50
250 vis. No. 6 color	18.50	18.50	18.50
200 vis. No. 6 color	18.00	18.00	18.00
PALE ENGINE OILS (Vis. 100°)			
230 vis. No. 3¾ color	23.50	23.50	23.50
180 vis. No. 3¼ color	19.50	19.50	19.50
100 vis. No. 2¼ color	15.50	15.50	15.50
MOTOR OILS (Vis. 100°)			
600 vis. No. 7 color	34.50	34.50	34.50
500 vis. No. 6¼ color	32.50	32.50	32.50
400 vis. No. 7¼ color	30.50	30.50	30.50
300 vis. No. 6 color	29.50	29.50	29.50
200 vis. No. 3¼ color	20.00	20.00	20.00
MEDICINAL OILS			
875-885 s.g.	$0.80	$0.80	$0.80
865-870 s.g.	$0.70	$0.70	$0.70
WAXES (In cents per pound, f.a.s. carload lots)			
WHITE CRUDE SCALE (In barrels)			
122-124 A.m.p.	5.125– 5.25	5.00	5.125– 5.375
124-126 A.m.p.	5.125– 5.25	5.00	5.125– 5.375
FULLY REFINED (In burlap bags)			
123-125 A.m.p. Phila	5.625– 5.75	5.625– 5.75	5.75
125-127 A.m.p.	5.75 – 5.875	5.625– 5.75	5.875– 6.00
128-130 A.m.p.	5.875– 6.00	5.75 – 5.875	6.25
130-132 A.m.p.	6.50	6.50	6.50 – 6.75
133-135 A.m.p.	7.25	7.25	7.25 – 7.50
135-137 A.m.p.	7.75	7.75	7.75
YELLOW CRUDE SCALE			
124-126 A.m.p.	5.00	4.875– 5.00	5.00

Gulf Export Market

(Prices are f. o. b. Gulf oil terminals in Texas and Louisiana, shipments of 20,000 bbls. and over unless otherwise noted, representing sellers' opinions, except those prices specified to the contrary)

GASOLINE	Oct. 15	Oct. 8	Oct. 1
U. S. Motor	9.125– 9.25	9.50 –10.00	9.375– 9.875
60-62 400 e.p.	10.00	10.25 –10.50	10.25
61-63, 390 e.p.	10.50 –10.75	10.875–11.00	10.875–11.00
64-66, 375 e.p.	10.875–11.00	11.25	11.125–11.25
U. S. Motor, cases (cargoes)	$1.85	$1.85 –$1.90	$1.85 –$1.90
64-66, cases (cargoes)	$2.00	$2.00 –$2.05	$2.00 –$2.05
KEROSENE			
44 water white	7.75 – 8.00	7.75	7.75
41-43 prime white	6.50 – 6.75	6.75	6.75
Water white, cases (cargoes)	$1.65	$1.65	$1.65
Prime white, cases (cargoes)	$1.55	$1.55	$1.55
DOMESTIC GAS & BUNKER OILS			
*26-30 translucent gas oil	3.875– 4.00	3.875– 4.00	3.875– 4.00
*30-32 translucent gas oil	4.00	4.00	4.00
Grade C bunker oil	$0.85 –$0.95	$0.85 –$0.95	$0.85 –$0.95
Grade C bunker oil, cargoes	$.065 –$0.70	$0.65 –$0.70	$0.65 –$0.70

***Less than ½ of 1% sulfur.**

MEXICAN CRUDE AND BUNKER OILS (F. O. B. Steamer, Tampico)			
Heavy Panuco crude taxes to be paid	$0.90 –$0.95	$0.95	$0.95
Grade C bunker oil, for bunkering purposes, taxes paid	$1.05	$1.05	$1.05

SOUTH TEXAS LUBRICATING OILS (Viscosity at 100°F.: cold test 0) (Tanker, f.o.b. Houston)

100 vis. No. 2 unfiltered pale	5.75 – 6.00	5.75	5.75
200 vis. No. 3 unfiltered pale	8.50 – 9.00	8.50 – 9.00	8.50 – 9.00
300 vis. No. 3 unfiltered pale	9.50 –10.00	9.50 – 9.875	9.50 – 9.875
500 vis. No. 3¼ unfiltered pale	10.75 –11.50	10.75 –11.50	10.75 –11.50
750 vis. No. 4 unfiltered pale	12.50 –13.00	12.50 –13.00	12.50 –13.00
1200 vis. No. 5 unfiltered pale	15.50 –17.00	15.50 –16.00	15.50 –16.00
200 vis. No. 5-6 red oil	7.00 – 8.00	7.00 – 8.00	7.00 – 8.00
300 vis. No. 5-6 red oil	8.00 – 9.00	8.00 – 9.00	8.00 – 9.00
500 vis. No. 5-6 red oil	9.75 –10.50	9.75 –10.50	9.75 –10.50
750 vis. No. 5-6 red oil	11.25 –12.00	11.25 –11.50	11.25 –11.50
1200 vis. No. 5-6 red oil	14.50 –16.50	14.50 –16.50	14.50 –16.50

Pacific Export Market

(Quotations are at seaboard, Los Angeles, in cargo lots, cents per gallon, except where otherwise noted.)

	Oct. 15	Oct. 8	Oct. 1
Gasoline, U. S. Motor, 53-55 Gravity	8.25 – 8.75	8.25 – 9.00	8.50 – 9.00
Gasoline, U. S. Motor, blends and special cuts	9.00 –10.75	9.00 –11.25	9.00 –11.50
Gas Oil, 30-34, per barrel	$1.10 –$1.20	$1.10 –$1.20	$1.10 –$1.20
Diesel Oil, 27 plus, per barrel	$0.95 –$1.10	$0.95 –$1.10	$0.95 –$1.10
Bunker oil, 14-18, per barrel	$0.75 –$1.00	$0.75 –$1.00	$0.80 –$1.00
Fuel oil, 14-18 per barrel	$0.70 –$1.00	$0.70 –$1.00	$0.70 –$1.00
Kerosene, 38-40 w.w., 125-150 flash, per gal.	5.25 – 6.25	5.75 – 6.25	5.50 – 6.00
Cased Goods			
Gasoline, U. S. Motor	$1.75 –$1.85	$1.75 –$1.85	$1.75 –$1.85
Kerosene, 38-40 w.w., 125-150 flash	$1.50 –$1.60	$1.50 –$1.60	$1.50 –$1.60

Tanker Rates

(Approximate tanker freight rates to Continental ports, in shillings per ton of 2240 pounds, British sterling, to American ports, cents per barrels)

	Oct. 15	
	Crude &/or Fuel	Refined Oil
Calif. to U. K. or Continental ports*	25/6	25/6
Gulf to U. K. or Continental ports*	14	13/6
North Atlantic to U. K. or Continental ports*	12/3	11/6
Calif. to North Atlantic ports (not E. of N. Y.)	50-55c	65c
Gulf and North Atlantic ports (not E. of N. Y.)**	16-17c	20–25c

*Continental ports in the range between Bordeaux and Hamburg, both inclusive.

**For Venezuela loading 1c per bbl. additional. For Tampico loading 4c per bbl. additional.

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41-43 W. W. Kerosene
36-38 Straw Distillate
32-36 Gas Oil Uncracked
22-26 Fuel Oil (Cushing or
24-26 Fuel Oil Blackwell)

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Tank Wagon Price Changes

Gasoline Changes

Standard of Kentucky—T.w. price gasoline reduced 2 cents, s.s. price 3 cents, Montgomery, to 21 cents and 22 cents respectively, including 4-cent state tax, **Oct. 10.**

S.s. price only of gasoline reduced 2 cents, Pensacola, to 24 cents, including 5-cent state tax, **Oct. 10.** T.w. unchanged at 24 cents.

T.w. and s.s. price gasoline reduced 2 cents, Jackson, to 19 cents and 21 cents respectively, including 4-cent state tax, **Oct. 6.**

Standard of Indiana—S.s. price only of gasoline cut 2 cents, Flint, Mich. to 18.8 cents, including 3-cent state tax, **Oct. 11.** T.w. unchanged at 18.8 cents.

* * *

Kerosene Changes

Magnolia Petroleum—Kerosene advanced 1 cent, through Oklahoma, **Sept. 12.** T.w. at Muskogee and Oklahoma City became 12 cents, and at Tulsa, 10 cents.

Kerosene advanced 1 cent, Fort Smith, to 14 cents t.w., **Sept.** 8. and 1 cent at Little Rock, to 14 cents t.w., **Aug. 14.**

Weather Enlivens Eastern Gasoline Market

(*Continued from Page* 224)

was still booking orders at this price Oct. 13.

Goods in this instance were being offered through a resale agent by a leading refining company and it was designed to meet the secret offers coming from other sources at the same price, it was asserted.

California gasoline was available at 11.25 cents at New York harbor terminals most of the week. One large dealer in this commodity said he was maintaining his price at 11.50 cents but with no success.

Philadelphia and Baltimore markets leveled out to 11.25 cents flat for both the regular U. S. Motor and California grades of gasoline. Prices further south on the seaboard also were down 0.25-cent generally but New England markets remained at the old levels.

Gasoline from other areas was working its way into New England districts in view of the firm position of refiners in these sections. The outside stuff, however, failed to affect the quotations of New England sellers proper. Several of them asserted they were meeting competition

(*Continued on Page* 230)

Tank Wagon, Service Station Markets for Gasoline and Kerosene

(OIL PRICE HANDBOOK has t.w. and s.s. markets for the whole year, arranged for quick reference)

These Prices in Effect Oct. 15, 1928, as Posted by Principal Marketing Companies

S.O. NEW JERSEY TERRITORY

	Gasoline T.W.	Gasoline Tax	Gasoline Total T.W.	Gasoline S.S.	Oil T.W.
Atlantic City, N. J.	17	2	19	20	14
Newark, N. J.	17	2	19	20	14
Annapolis, Md.	17	4	21	23	14
Baltimore, Md.	17	4	21	23	11
Cumberland, Md.	17	4	21	23	14
Washington, D. C.	17	2	19	21	14
Danville, Va.	17	5	22	*	14
Norfolk, Va.	14	5	19	20	14
Richmond, Va.	17	5	22	24	14
Roanoke, Va.	17	5	22	24	14
Petersburg, Va.	17	5	22	24	14
Charleston, W. Va.	17	4	21	23	14
Keyser, W. Va.	17	4	21	23	14
Parkersburg, W. Va.	17	4	21	23	14
Wheeling, W. Va.	17	4	21	23	14
Charlotte, N. C.	17	4	21	23	14
Hickory, N. C.	17	4	21	23	14
Mt. Airy, N. C.	17	4	21	23	14
Salisbury, N. C.	17	4	21	23	14
Charleston, S. C.	17	5	22	24	14
Columbia S. C.	17	5	22	24	14

*Dealers set own prices. S. O. New Jersey does not operate station.

S. O. NEW YORK

Due to local price conditions at many points in S. O. New York territory, actual prices on both gasoline and kerosene are being made at under the posted tank wagon prices published below.

New York City	18	0	18	*20	15
Albany, N. Y.	18	0	18	21	15
Buffalo, N. Y.	18	0	18	20	15
Rochester, N. Y.	18	0	18	20	13
Syracuse, N. Y.	18	0	18	20	15
Boston, Mass.	18	0	18	20	15
Augusta, Me.	18	4	22	24	15
Manchester, N. H.	18	4	22	24	15
Burlington, Vt.	18	3	21	23	15

*The Standard of New York does not operate stations in New York City. This figure is the retail price of a principal station operator in New York, selling Socony gasoline.

ATLANTIC REFINING

Pittsburgh, Pa.	17	*	17	*22	15
Philadelphia, Pa.	17	*	17	*22	15
Allentown, Pa.	17	*	17	*22	15
Erie, Pa.	17	*	17	*22	15
Scranton, Pa.	17	*	17	*22	15
Altoona, Pa.	17	*	17	*22	15
Dover, Del.	17	3	20	22	15
Wilmington, Del.	17	3	20	22	15
Providence, R. I.	18	2	20	22	15
Boston, Mass.	18	0	18	20	15
Springfield, Mass.	18	0	18	20	15
Worcester, Mass.	18	0	18	20	15
Hartford, Conn.	18	2	20	22	14
New Haven, Conn.	18	2	20	22	15

*3-cent state tax is collected by retail dealer and paid by him directly to state.

S. O. KENTUCKY

Ashland, Ky.	17	5	22	24	15.5
Catlettsburg, Ky.	17	5	22	24	15.5
Lexington, Ky.	16	5	21	23	15.5
Louisville, Ky.	16	5	21	23	15
Covington, Ky.	17	5	22	22	15.5
Clarksdale, Miss.	17	4	21	23	13
Gulfport, Miss.††	18.5	4	22.5	24.5	14
Jackson, Miss.	15	4	19	21	14.5
Natchez, Miss.	16.5	4	20.5	22.5	14
Vicksburg, Miss.	16.5	4	20.5	22.5	14
Birmingham, Ala.	14	4	18	20	14
Mobile, Ala‡	18	4	22	24	15
Montgomery, Ala.*	17	4	21	22	16.5
Atlanta, Ga.	18	4	22	24	†16.5
Augusta, Ga.	18	4	22	24	†15.5
Macon, Ga.	18	4	22	24	†16.5
Savannah, Ga.	17	4	21	21	†15.5
Jacksonville, Fla.	18	5	23	25	14.5
Miami, Fla.	19	5	24	26	15.5
Tampa, Fla.	18	5	23	25	14.5
Pensacola, Fla.**	19	5	24	24	14.5

*Local privilege tax of 1 cent on gasoline and ½ cent on kerosene at Montgomery included. ‡Mobile gasoline prices include 1c city tax.

†Georgia kerosene prices include 1c state tax.

**Both tank wagon prices include 1c city tax at Pensacola, which went into effect Oct. 15, 1926.

††Both tank wagon prices at Gulfport include Harrison county privilege tax of 2c.

S. O. INDIANA

	Gasoline T.W.	Gasoline Tax	Gasoline Total T.W.	Gasoline S.S.	Oil T.W.
Chicago, Ill.	15	0	15	17	12
Decatur, Ill.	15.2	0	15.2	17.2	12.1
E. St. Louis, Ill.	14.4	0	14.4	16.4	11.2
Joliet, Ill.	15.4	0	15.4	17.4	12.3
Peoria, Ill.	15.2	0	15.2	17.2	12.1
Quincy, Ill.	15.2	0	15.2	17.2	11.9
Indianapolis, Ind.	15.2	3	18.2	20.2	13.2
Evansville, Ind.	15	3	18	20	13
South Bend, Ind.	15.4	3	18.4	20.4	13.4
Detroit, Mich.	15.8	3	18.8	20.8	13.7
Grand Rapids, Mich.	15.7	3	18.7	20.7	13.6
Saginaw, Mich.	15.9	3	18.9	20.9	13.8
Green Bay, Wis.	15.6	2	17.6	19.6	12.4
Madison, Wis.	15.3	2	17.3	19.3	12.1
Milwaukee, Wis.	15.1	2	17.1	19.1	11.9
La Cross, Wis.	16.2	2	18.2	20.2	13
Minneapolis, Minn.	16.2	2	18.2	20.2	12.9
Duluth, Minn.	16.5	2	18.5	20.5	12.9
Mankato, Minn.	16.1	2	18.1	20.1	12.7
Des Moines, Ia.	15.5	3	18.5	20.5	12.3
Davenport, Ia.	15.5	3	18.5	20.5	12.3
Sioux City, Ia.	15.1	3	18.1	20.1	11.9
Mason City, Ia.	15.5	3	18.5	20.5	12.3
St. Louis, Mo.	*14.9	2	16.9	18.9	11.3
Kansas City, Mo.	†15.9	2	17.9	19.9	10.6
St. Joseph, Mo.	†15.5	2	17.5	19.5	11.2
Fargo, N. D.	17.9	2	19.9	21.9	14.9
Grand Forks, N. D.	18.2	2	20.2	22.2	15.2
Minot, N. D.	17.9	2	19.9	21.9	14.9
Pierre, S. D.	16	4	20	22	13.4
Huron, S. D.	16.3	4	20.3	22.3	13.7
Wichita, Kans.	13.8	2	15.8	17.8	10.8
Bartlesville, Okla.	13.5	3	16.5	18.5	10.5

S. O. Indiana's quantity contract price schedule on tank truck deliveries of gasoline, figured from the service station price, is 2c for 500 gals. or more a month; 2½c for 2000 gals. or more a month; and 3c for 6000 gals. or more a month.

*Includes city tax of ½c.

†Includes city tax of 1c.

CONTINENTAL OIL

Denver, Colo.	16	3	19	22	14.5
Pueblo, Colo.	16	3	19	22	14.5
Grand Junc., Colo.	19.5	3	22.5	25.5	18
Casper, Wyo.	16	3	19	22	13
Cheyenne, Wyo.	17	3	20	23	14.5
Butte, Mont.	20.5	3	23.5	26.5	19
Helena, Mont.	20.5	3	23.5	26.5	19
Salt Lake City, Utah	18.5	3½	22	25	17
Boise, Ida.	20.5	4	24.5	27.5	19
Twin Falls, Ida.	20.5	4	24.5	27.5	19
Albuquerque, N. M.	17	5	22	25	17

S. O. CALIFORNIA

Phoenix, Ariz.	12	4	16	20	21.5
Los Angeles, Cal.	13.5	3	16.5	20.5	15.5
Fresno, Cal.	14	3	17	21	16.5
San Francisco, Cal.	14	3	17	21	15.5
Reno, Nev.	18	4	22	26	19
Portland, Ore.	14.5	3	17.5	21.5	16.5
Seattle, Wash.	14.5	2	16.5	20.5	16.5
Spokane, Wash.	18.5	2	20.5	24.5	20.5
Tacoma, Wash.	14.5	2	16.5	20.5	16.5

S. O. LOUISIANA

Little Rock, Ark.	16	5	21	23	14
Alexandria, La.	15	2	17	19	†16
Baton Rouge, La.	14	2	16	18	†14.5
Lake Charles, La.	15.5	2	17.5	19.5	†16
New Orleans, La.	*15.5	2	*17.5	*19.5	†16
Shreveport, La.	15.5	2	17.5	19.5	†15
Lafayette, La.	15	2	17	19	†15.5
Bristol, Tenn.	18	3	21	23	15
Chattanooga, Tenn.	17.5	3	20.5	22.5	16
Knoxville, Tenn.	18	3	21	21	16
Nashville, Tenn.	17	3	20	22	16
Memphis, Tenn.	16	3	19	21	15

*New Orleans gasoline prices include 1c parish tax in addition to 2c state tax, and kerosene prices include 1c state tax and 1c parish tax.

†Kerosene price in Louisiana includes 1c state tax.

S. O. OHIO

	Gasoline T.W.	Gasoline Tax	Gasoline Total T.W.	Gasoline S.S.	Oil T.W.
All Ohio points	16	3	19	20	14

S. O. NEBRASKA

Omaha, Neb.	15.25	2	17.25	19.25	12.25
McCook	16.75	2	18.75	20.75	13.75
Norfolk	15.75	2	17.75	19.75	12.75
North Platte	16.75	2	18.75	20.50	13.50
Scottsbluff	16.75	2	18.75	20.75	13.25

MAGNOLIA PETROLEUM

Muskogee, Okla.	15	3	18	20	12
Oklahoma City	15	3	18	20	12
Tulsa, Okla.	14	3	17	19	10
Fort Smith, Ark*	16	*2	18	20	14
Little Rock, Ark.	16	5	21	23	14
Texarkana, Ark.*	14.5	*2	16.5	20.5	13
Dallas, Tex.	14	2	16	20	12
Fort Worth, Tex.	14	2	16	19	12
Houston, Tex.	14	2	16	20	15
San Antonio, Tex.	12	2	14	17	11
El Paso, Tex.	15	2	17	20	16

*Within City of Texarkana and Fort Smith, the state tax on gasoline is 2c per gal. conforming with the Texas state tax. In these two districts outside of the city the 5c Arkansas tax applies.

V. M. & P. NAPHTHA

(Changes ordinarily occur coincident with gasoline price changes)

	Oleum Spirits	V.M.&P. Naphtha	Cleaner Naphtha
Chicago	14.7	16.2	18
Detroit	16.4	17.9	19.7
Kansas City	†14.9	†16.4	†18.2
Milwaukee	15.4	*18.9	*20.7
Minneapolis	*18.7	*20.2	*22
St. Louis	14.6	16.1	17.9
New York		20	....

*Includes 2c state tax. †Includes 1c city tax.

CANADA

(Per Imperial Gallon, which is 1.2 American Gallons)

ONTARIO

	Gasoline T.W.	Gasoline Tax	Gasoline Total T.W.	Gasoline S.S.	Oil T.W.
Toronto	20.5	3	23.5	27	22
Ottawa	20.5	3	23.5	27	22
Cochrane	25.5	3	28.5		27
Ft. William	23.5	3	26.5	30	23.5

MANITOBA

Winnipeg	22.5	3	25.5	29	22.5

SASKATCHEWAN

Regina	27	3	30	34	27

ALBERTA

Edmonton	27.5	3	30.5	34	27.5
Calgary	22.5	3	25.5	29	22.5

BRITISH COLUMBIA

Vancouver	22	3	25	28	23

QUEBEC

Montreal	21.5	5	26.5	30	22
Quebec City	22.5	5	27.5	31	23
Three Rivers	22.5	5	27.5	31	23

NEW BRUNSWICK

St. John	23.5	3	26.5	30	25
Moncton	23.5	3	26.5	30	25

NOVA SCOTIA

Halifax	23.5	5	28.5	32	25
Sydney	23.5	5	28.5	32	25

PRINCE EDWARD ISLAND

Charlottetown	23.5	5	28.5	32	25

Note: In districts surrounding these points 1c additional is added to city price.

Above prices include these inspection fees on both gasoline and kerosene, per gallon: Alabama, 1/40c on gasoline, 1/2c kerosene; Arkansas, 1/20c on both; Colorado, 1/10c on both; Florida, 1/8c on both; Indiana, 2/25c on both; Kansas, 1/50c on both; Louisiana, 1/32c on gasoline, 1c on kerosene; Minnesota, 3/50c on both; Missouri, 1/50c on both; Nebraska, 3/50 to 1/2c on both; North Carolina, 1/4c on both; North Dakota, 1/20c on both; Oklahoma, 4/25c on both; South Carolina, 1/8c on both; South Dakota, 1/10c on both; Tennessee, 2/5c on gasoline and 1/2c on kerosene; Wisconsin, 3/50c on both.

Kerosene inspection fees only: Iowa, 13/100c; Michigan, 1/5 to 4/5c per gal.

In Illinois, cities and villages have the power to appoint oil inspectors and fix inspection fees which is done in some instances. In some cases in the above states or other states there are local inspection fees.

Crude Oil Prices (in Effect Oct. 15)

(Crude prices for the whole year in OIL PRICE HANDBOOK published annually)

EASTERN FIELDS

(Posted by Joseph Seep Purchasing Agency

Penna. Grade Oil in New York Transit Lines (Allegheny, N. Y. District)	$3.45
Bradford District Oil in National Transit Lines (Bradford District)	3.45
Penna. Grade Oil in National Transit Lines (Other Pennsylvania)	3.35
Penna. Grade Oil in Southwest Penna. Pipe Lines (Other Pennsylvania)	3.35
Penna. Grade Oil in Eureka Pipe Lines (West Virginia)	3.25
Penna. Grade Oil in Buckeye Pipe Lines (Macksburg, O. district)	3.10
Cabell Grade in Eureka Pipe Lines (West Virginia)	1.45
Corning Grade in Buckeye Pipe Lines (Ohio)	1.80
Corning, O., heavy grade	1.70
Somerset Oil in Cumberland Pipe Lines (Kentucky)	1.75
Ragland Grade in Cumberland Pipe Lines (Kentucky)	.95

(Posted by Stoll Oil Refining Co.)

Oil City, Ky., oil in Stoll lines	$1.75

CENTRAL STATES FIELDS

Posted by Ohio Oil Co.

Effective July 27, 1928

Wooster	$1.67	Princeton	$1.55
Lima	1.60	Illinois	1.55
Waterloo	1.20	Plymouth	1.28
Indiana	1.37	West Kentucky	1.63

CANADIAN CRUDE

Posted by Imperial Oil Refineries, Ltd.

Petrolia	$2.00
Oil Springs	2.07

OKLAHOMA, KANSAS and NORTH TEXAS

Prices of Prairie Oil & Gas Co.

(In Oklahoma, Kansas, North and East Central Texas)

Effective July 26, 1928

Below 25	$0.60	35-35.9	$1.31
25-25.9	0.67	36-36.9	1.36
26-26.9	0.74	37-37.9	1.41
27-27.9	0.81	38-38.9	1.46
28-28.9	0.88	39-39.9	1.51
29-29.9	0.95	40-40.9	1.56
30-30.9	1.02	41-41.9	1.61
31-31.9	1.09	42-42.9	1.66
32-32.9	1.16	43-43.9	1.71
33-33.9	1.21	44 and above	1.76
34-34.9	1.26		

Humble Oil & Refining Co. Prices

(Ranger, North Texas, Mexia, Powell, Richland, Wortham, Lytton Springs, Currie, Moran and Nocona crudes all in Texas.)

July 26, same schedule as Prairie.

Mirando, Tex	$1.00

Magnolia Petroleum Co.

(In Oklahoma, Kansas and North and East Central Texas)

July 26, Magnolia posted in above fields and in Panola Co., same schedule as Prairie, except these grades:

Below 25	$0.60	27-27.9	$0.75
25-25.9	0.67	30-30.9	0.90
26-26.9	0.74	31-31.9	1.05

Glasscock, Crane, Upton, Winkler Counties	0.65
Chalkfield (Howard Co.)	0.80
Iatan district	0.93
Corsicana heavy	1.00

Carter Oil Co.

(Oklahoma and Kansas)

July 26, same schedule as Prairie except Carter does not post oil below 25.

PANHANDLE, TEXAS

Humble Oil & Refining Co.

Effective July 26, 1928

Hutchinson and Carson Counties:

Below 32	$0.69	38-38.9	$1.06
32-32.9	0.76	39-39.9	1.11
33-33.9	0.81	40-40.9	1.16
34-34.9	0.86	41-41.9	1.21
35-35.9	0.91	42-42.9	1.26
36-36.9	0.96	43-43.9	1.31
37-37.9	1.01	44 and above	1.36

Wheeler County:

Below 30	$0.65	37-37.9	$1.11
30-30.9	0.72	38-38.9	1.16
31-31.9	0.79	39-39.9	1.21
32-32.9	0.86	40-40.9	1.26
33-33.9	0.91	41-41.9	1.31
34-34.9	0.96	42-42.9	1.36
35-35.9	1.01	43-43.9	1.41
36-36.9	1.06	44 and above	1.46

Gray County:

Below 29	$0.68	37-37.9	$1.21
29-29.9	0.75	38-38.9	1.26
30-30.9	0.82	39-39.9	1.31
31-31.9	0.89	40-40.9	1.36
32-32.9	0.96	41-41.9	1.41
33-33.9	1.01	42-42.9	1.46
34-34.9	1.06	43-43.9	1.51
35-35.9	1.11	44 and above	1.56
36-36.9	1.16		

WEST TEXAS

Humble Oil & Refining Co.

Effective July 26, 1928

Winkler, Crane, Upton, Crockett, and Pecos Counties	$0.65

NORTH LOUISIANA—ARKANSAS FIELDS

Prices of Standard Oil Co. of Louisiana

Caddo, Homer, Haynesville, Bull Bayou, El Dorado, Crichton, De Soto and **Cotton Valley.

Effective July 26, 1928

Below 28	$0.81	36-36.9	$1.36
28-28.9	0.88	37-37.9	1.41
29-29.9	0.95	38-38.9	1.46
30-30.9	1.02	39-39.9	1.51
31-31.9	1.09	40-40.9	1.56
32-32.9	1.16	41-41.9	1.61
33-33.9	1.21	42-42.9	1.66
34-34.9	1.26	43-43.9	1.71
35-35.9	1.31	44 and above	1.76

**Cotton Valley, below 36, $0.75. Beginning with 36-36.9, same schedule as above.

Smackover, below 24	$0.75
do 24 and above	.90
Bellevue	1.25
*Urania, La.	.85
†East El Dorado	0.75

*Posted by Louisiana Oil Refining Corp.

†Posted by Magnolia Petroleum Co.

Smackover prices posted on Feb. 7 by S. O. La., Gulf, Shreveport-El Dorado Pipe Line, Atlantic Oil Producing Co. and The Texas Co.; on Feb. 8 by Magnolia; on Feb. 6 by La. Oil Refg. Corp.

Aug. 8 The Texas Co., same schedule in Louisiana as Standard, plus these grades: 24-24.9, $0.60; 25-25.9, $0.67; 26-26.9, $0.74; 27-27.9, $0.81.

Aug. 7 Magnolia Petroleum met Standard schedule in Louisiana-Arkansas fields.

STEPHENS, ARKANSAS

Louisiana Oil Refining Corp., and Atlantic Oil Producing Co.

Effective Aug. 2, 1928

Below 28	$0.75	30-30.9	$0.87
28-28.9	0.79	31-31.9	0.91
29-29.9	0.84	32 and above	0.95

GULF COASTAL

Posted by Humble Oil & Refining Co.

Effective March 14, 1927

Grades A	$1.20	29-29.9	$1.25
Grades B:		30-30.9	1.27
Below 25	1.15	31-31.9	1.29
25-25.9	1.17	32-32.9	1.31
26-26.9	1.19	33-33.9	1.33
27-27.9	1.21	34-34.9	1.35
28-28.9	1.23	35 and above	1.37

Fields classified as A and B are Spindletop, Goose Creek, Hull, Liberty, Sour Lake, West Columbia, Orange, Boling and Pierce Junction. All other fields are Grades A only.

down to 13 cents delivered, but this was by no means general.

In the Boston district all sellers continued to quote U. S. Motor at 12.25 cents on an f.o.b. basis with delivered prices of 13 to 13.50 cents. One important factor in the Providence district openly reduced its prices to 11.75 cents, f.o.b. terminal with a minimum delivered price of 13 cents.

New England tank wagon markets were said to be in good shape. At least this was the opinion of large buyers as well as sellers. Posted prices were unchanged at 17 cents with concessions largely 1 cent and in some instances 2 cents. An occasional distress car which reached a small dealer was used to cut markets rather sharply, it was reported, but for the most part prices were held pretty much in line.

There was continued good demand for kerosene all week and Saturday's advance in Pennsylvania crude stiffened prices for this commodity still more. Shading of 9 cents for water white kerosene, which was done in several instances last week, was impossible this week, according to reports.

Domestic burning oils were in fair demand. The 36-40 was available in one or two quarters in the Boston district at 6.25 cents but a minimum of 6.50 cents was quoted at New York harbor. This represents 0.5-cent advance over last week.

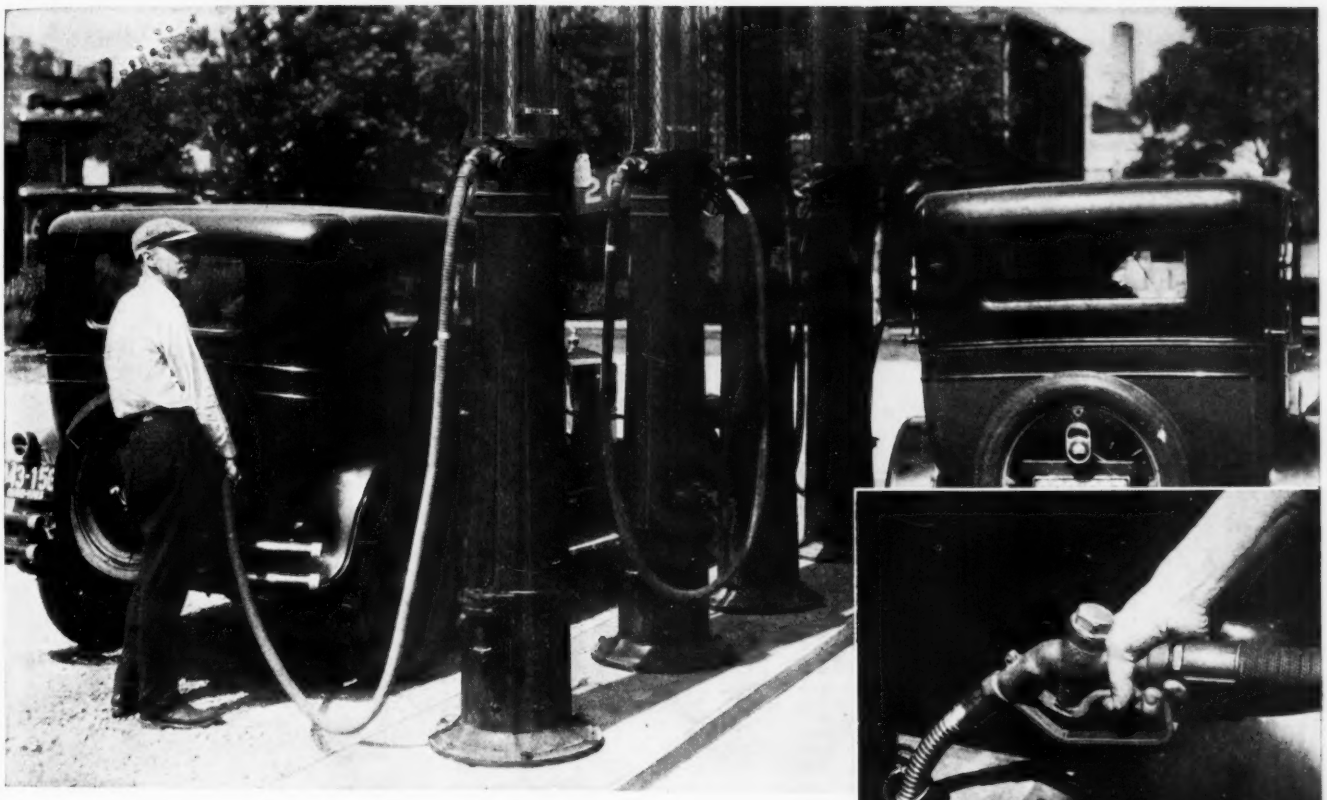
Venezuelan Crude Quoted 90 Cents

NEW YORK, Oct. 13.—Spot cargoes of Venezuela crude oil were quoted this week at around $0.90 a barrel, f.o.b. deepwater in the Lake Maracaibo region. No spot business has been reported placed since the low of $0.76 a barrel was touched a few weeks ago, but sellers are reported to be firm in their quotations at $0.90. Under the prevailing tanker rate of 16 cents a barrel, this figures $1.06 a barrel laid down north of Cape Hatteras and $1.08 a barrel east of New York.

Crude Price Changes

OIL CITY.—On Oct. 13 Joseph Seep Purchasing Agency advanced all grades of Pennsylvania crude 10 cents per barrel. Other eastern grades were unchanged. Last previous change on Pennsylvania was a 15 cent advance on Sept. 14. New prices are:

Pennsylvania grade oil New York Transit and National Transit lines (Bradford-Allegheny district), $3.45; Pennsylvania oil in National Transit and in Southwest Pennsylvania Pipe Line lines (rest of Pennsylvania), $3.35; Pennsylvania oil in Eureka lines (West Virginia district), $3.25; Pennsylvania oil Buckeye Pipe Line lines (Macksburg, O. district), $3.10.



With the Right Equipment He's a *Salesman!*

SAYS the man at the pump, "Will she hold another one, Sir?" And the answer is, "No, let it go at that." But put your operator at the hose end where he can see his pump gauge and the customer's tank too—give him a pump that will deliver that extra gallonage at the squeeze of his fist . . . then he can be a salesman. "She'll hold two more, Sir" calls for only one answer—"Put 'em in." Nozzle control permits your operators to take the initiative in this business of "extra gallonage."

In the complete RAPIDAYTON line there are two extremely fast nozzle control pumps, Cut 600 and Cut 625. Their specifications are given in the new RAPIDAYTON catalog. Write for your copy today.

THE DAYTON PUMP & MFG. COMPANY
Dept. G-2, Dayton, Ohio, U. S. A.

1 RAPIDAYTON eye measurement pumps Nos. 600 and 625 with nozzle control provide rapid delivery. Result—peak output during rush hours.

2 The customer hears the gas pouring into his tank *as soon as the liquid level in the glass cylinder begins to lower* . . . He is convinced of full measure.

3 Because the operator knows definitely "how many more she will hold" he can successfully sell extra gallonage.

4 Low cost. Add a pump or two. Give Super Service.

Co. 1928 T.D.P.&M. Co.

Rapidayton

TRADE MARK REG. U.S. PAT. OFF.

Crude Oil Prices (in Effect Oct. 15)

(Crude prices for the whole year in OIL PRICE HANDBOOK published annually)

GULF COASTAL

Prices of The Texas Co.

Effective March 14, 1927

Grades A	$1.20	*Grades B	$1.15
‡Grades B (light crude):			
35-35.9	$1.37	38-38.9	$1.43
36-36.9	1.39	39-39.9	1.45
37-37.9	1.41	40 and above	1.47

*Grades B include all heavy crudes which do not meet tests for Grades A or for Gulf Coast light crude.

‡The Texas Co.'s gravity and price schedule on all below 35° is same as Humble's postings on Grades B.

ROCKY MOUNTAIN FIELDS

Prices of Ohio Oil Co., and Midwest Refining Co.

(Salt Creek prices effective July 26, 1928)

‡Salt Creek 29-29.9	$0.95
" " 30-30.9	1.02
" " 31-31.9	1.09
" " 32-32.9	1.16
" " 33-33.9	1.21
" " 34-34.9	1.26
" " 35-35.9	1.31
" " 36-36.9	1.36
" " 37 and above	1.41
Elk Basin	1.48
Grass Creek light	1.48
Big Muddy	1.33
Lance Creek	1.48
Rock Creek	1.33
Mule Creek	1.10
Rex Lake	1.10
‡Osage	1.48
‡Cat Creek, Mont.	1.48
Sunburst, Mont.	1.65
‡Hogback, N. Mex.	1.48
Artesia, N. Mex.	1.08

‡Posted by Midwest Refining Co. Midwest also buys Grass Creek light and Elk Basin.

CALIFORNIA

Standard Oil Co. of California

Santa Maria and Ventura Posted by Union Oil Co.

Gravity	Signal Hill Seal Beach Alamitos Heights Huntington Beach	Inglewood Torrance	Olinda-Brea Canon Richfield	Athens-Rosecrans Dominguez	Whittier La Habra	Coyote Hills	Santa Fe Springs	Newhall McKittrick Kern River	Midway Sunset Buena Vista & Elk Hills	Lost Hills	Coalinga	Wheeler Ridge	Montebello	Santa Maria	Ventura
14-14.9	$ .85	$ .85	$ .85	....	$ .85	$ .85	....	$ .75	$ .75	$ .75	$ .75	$ .75	$ .85	$ .85	$ .85
15-15.9	.85	.85	.85	....	.85	.85	....	.75	.75	.75	.75	.75	.85	.85	.85
16-16.9	.85	.85	.85	....	.85	.85	....	.75	.75	.75	.75	.75	.85	.85	.85
17-17.9	.85	.85	.85	....	.85	.85	....	.75	.75	.75	.75	.75	.85	.85	.85
18-18.9	.85	.85	.85	....	.85	.85	....	.75	.75	.75	.75	.75	.85	.85	.85
19-19.9	.85	.85	.85	....	.85	.85	....	.75	.75	.75	.75	.75	.85	.85	.85
20-20.9	.85	.85	.85	....	.85	.85	....	....	.77	.77	.77	.77	.86	.85	.85
21-21.9	.89	.89	.89	....	.88	.88	.89	....	.79	.79	.79	.79	.89	.86	.86
22-22.9	.93	.93	.93	....	.91	.91	.92	....	.82	.82	.82	.82	.92	.87	.87
23-23.9	.97	.97	.97	....	....	.94	.95	....	.86	.86	.85	.85	.95	.90	.90
24-24.9	1.01	1.01	1.01	1.01	....	.97	.98	....	.90	.90	.88	.88	.98	.93	.94
25-25.9	1.05	1.05	1.05	1.05	....	1.00	1.01	....	.95	.95	.91	.91	1.01	.95	.98
26-26.9	1.09	1.09	1.09	1.09	....	1.04	1.04	....	1.00	1.00	.94	.94	1.04	.97	1.02
27-27.9	1.13	1.13	1.13	1.13	....	1.08	1.07	....	1.05	1.05	.98	.97	1.07	....	1.06
28-28.9	1.17	1.17	1.17	1.17	....	1.12	1.10	....	1.10	1.10	1.02	....	1.10	....	1.10
29-29.9	1.21	....	1.21	1.21	....	1.16	1.15	....	1.16	1.16	1.06	....	1.13	....	1.14
30-30.9	1.25	....	1.25	1.25	....	1.20	1.20	....	1.22	1.22	1.10	....	1.16	....	1.18
31-31.9	1.30	....	....	1.30	....	....	1.25	....	1.28	1.28	1.14	....	....	....	1.23
32-32.9	1.35	....	....	1.35	....	....	1.30	....	1.34	1.34	1.18	....	....	....	1.28
33-33.9	....	....	....	1.41	....	....	1.35	....	1.40	1.40	1.22	....	....	....	....
34-34.9	....	....	....	1.47	....	....	1.40	....	....	1.46	1.26	....	....	....	....
35-35.9	....	....	....	1.53	....	....	1.45	....	....	....	1.30	....	....	....	....
36-36.9	....	....	....	1.59	....	....	1.50	....	....	....	....	....	....	....	....
37-37.9	....	....	....	1.65	....	....	1.55	....	....	....	....	....	....	....	....
38-38.9	....	....	....	1.71	....	....	1.60	....	....	....	....	....	....	....	....
39-39.9	....	....	....	1.77	....	....	1.65	....	....	....	....	....	....	....	....
40-40.9	....	....	....	1.83	....	....	....	....	....	....	....	....	....	....	....
41-41.9	....	....	....	1.89	....	....	....	....	....	....	....	....	....	....	....
42-42.9	....	....	....	1.95	....	....	....	....	....	....	....	....	....	....	....

*Union Oil Co. posts same prices in all above fields as Standard except in Montebello and Wheeler Ridge. It also posts Elwood Terrace at same price as Rosecrans—Dominguez and also posts Santa Maria (Orcutt) and Ventura.

REFINERS' and COMPOUNDERS' SUPPLIES

Following are average market prices for materials used by refiners and compounders as effective the date shown.

Refiners' Supplies

	Oct. 15	Oct. 8
Soda Ash light 58% bags, cwt.	$1.32	$1.32
Silicate of Soda 60 deg. drums, ...cwt.	$1.65	$1.65
Silicate of Soda 40 deg. tank cars....cwt.	$0.60	$0.60
Silicate of Soda 40 deg. drums ....cwt.	$0.70-0.75	$0.70-0.75
Sal Soda wks.	$0.90	$0.90
Caustic Soda 76% solid, cwt.	$2.90	$2.90
Sulfuric Acid 60 deg. tank cars, f.o.b. shipping point per ton	$11.00	$11.00
Oleum 20%, fuming sulfuric, tank cars, wks.	$18.50	$18.50
Sulfur, flowers of ....cwt.	$3.10-4.00	$3.10-4.00
Liquid Chlorine, tank cars, wks....lb.	3.50-5.00	3.50-5.00
Litharge, powered, casks, cwt.	9.00	9.00

Compounders' Supplies

	Oct. 15	Oct. 8
Vegetable Oils		
Linseed carloads, spot....lb.	10.20	10.00
Tanks, spot	9.40	9.20
Soya Bean, Tanks, coast, lb.	9.75	9.75
Oleic Acid		
Distilled, tanks....lb.	8.25	8.50
Distilled, bbls....lb.	9.50	9.50
Saponified, tanks....lb.	9.00	9.00
Saponified, bbls....lb.	9.75	9.75
Lard Oils		
Prime Winter Strained....lb.	16.50	16.50
Extra Winter Strained....lb.	14.00	14.00
Extra....lb.	13.25	13.25
Extra No. 1....lb.	13.00	13.00
No. 1....lb.	12.50	12.50
No. 2....lb.	12.125	12.125
Tallow oil....lb.	12.00	12.00
Neatsfoot Oil		
Pure, bbls....lb.	15.25	15.25
Extra, bbls....lb.	13.25	13.25
No. 1 bbls....lb.	12.75	12.75
Cold Pressed....lb.	19.00	19.00
Fish Oils		
Menhaden Oil		
Light Pressed....gal.	60	60
Light Pressed, tank cars, N. Y. ....gal.	52-53	52-53
White bleached....gal.	67-68	67-68
Yellow bleached....gal.	64-65	64-65
Whale, extra winter bleached, ...gal.	82	82
Naval Stores		
Steam distilled turpentine, N. Y....gal.	48	48
Steam distilled turpentine, Savannah....gal.	43	43
Gum turpentine, N. Y....gal.	53	53
Gum turpentine, f.o.b. cars Savannah....gal.	49	49
Wood Rosin F, N. Y....bbl.	$7.95	$7.95
Wood Rosin F, Savn'h..bbl.	$7.15	$7.15
Gum Rosin B, N. Y....bbl.	$8.80	$8.80
Gum Rosin B, f.o.b. cars Savannah....bbl.	$8.05	$8.05
Rosin oil, pure....gal.	58	58
Rosin oil, compounded...gal.	49	49
Pine Tar		
Kiln burnt....bbl.	$12.50-14.00	$12.50-14.00
Retort....bbl.	$13.50-15.50	$13.50-15.50
Alcohol		
Denatured, Formula 5, in bbls., per gal....	54-61	54-61

*Nominal.

CHIEF PALACINE—Wirt Franklin Petroleum Corporation's trade-mark—is emblematic of the high quality petroleum products that bear his name.

Backed by ample resources, Wirt Franklin Petroleum Corporation stands today as the only organization in Southern Oklahoma which maintains the complete cycle of the industry—Production—Pipe Lines—Refinery—Warehouse Stations and Service Stations. From Crude Oil at the well to the motorist's car, PALACINE quality never varies.

WIRT FRANKLIN PETROLEUM·CORPORATION

Ardmore, Oklahoma

COMPLETE SERVICE
GETS NEW CUSTOMERS
HOLDS OLD CUSTOMERS
and
PUTS MONEY
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THE MURDOCK
MONEY MAKING
CAR WASHER

It washes cars much faster, better and easier.

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It delivers more air per dollar than any air compressor on the market. Dependable, silent, economical performance, and its masterful appearance have gained it nation-wide approval.

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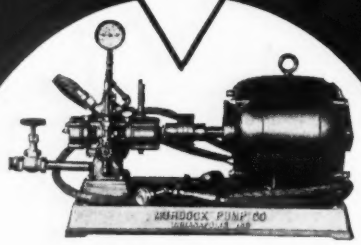
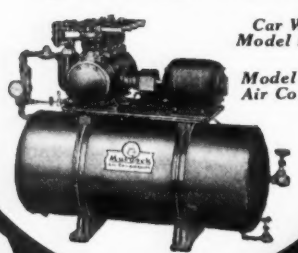


Car Washer
Model H. P. 2



Model A. C. 14
Air Compressor

MURDOCK
PUMP CO.
INDIANAPOLIS, U.S.A.

OIL FINANCES

National Petroleum News

Colon Oil Corp. Ready to Begin Development in Venezuela

NEW YORK, Oct. 13—A. H. BUNKER, president of Carib Syndicate, Ltd., has notified stockholders of that corporation that surveys of the Colon Oil Corp. concessions in Venezuela have been completed and it is possible now to proceed with drilling. Carib owns 25 per cent of the outstanding stock of Colon Oil Corp. which was formed last summer to take over the interests of Carib and the Royal Dutch-Shell group in the Colon Development Co. and the Colon Concession.

The Carib also holds 25 per cent of all the stock of the Colombian Petroleum Co., 59 per cent of all the stocks of the Equatorial Oil Co. and a 50 per cent interest in 45,000 acres at Honda, Colombia.

The Colon Concession has a frontage of 75 miles on the west shore of Lake Maracaibo and extends about 100 miles westward to the Colombian border. On it have been found two major anticlines. One is the Tarra, 30 miles long, and the other, the Oro, is 14 miles long.

All the domes tested at Tarra were found to contain commercial production, as were the two domes tested at Oro. Distance between extreme limiting wells is ten miles at Tarra and four miles on Oro. Of 22 wells completed on both structures, 20 have been commercial producers, 17 at Tarra and three at Oro. Total initial production of these exploratory wells shut in awaiting transportation, is about 13,000 barrels of oil averaging 30 degrees gravity, obtained from three horizons.

Three new camps have been built on the Tarra anticline, and a 67,500-barrel storage tank, and gathering pipe lines installed. Two narrow gauge railroads from Tarra River unloading ports to camps and a motor highway traversing the Tarra field have been completed.

A railroad from Zulia river to Tarra anticline has been authorized and should be completed within one year. This will materially shorten route from Lake Maracaibo to the concession. Five drilling rigs will be operated on the Tarra anticline.

Development program for next two years has been approved by Colon directors and with funds in hand it is planned to lay a 100-mile pipe line of 20,000 barrels daily capacity from Tarra field to Lake Maracaibo. Surveys have been made and completion is hoped for in 18 months.

Colon Oil Corp. contracted with Batavian Petroleum Co., wholly owned Royal Dutch-Shell subsidiary, to supervise and manage the Colon properties, subject to control of Colon directors. The Batavian company has had charge of Royal Dutch-Shell operations in Venezuela and has been a factor in profitable results obtained there.

President Bunker states Carib and the Gulf Oil Corp. are taking all possible steps to secure from the Colombian government a reconsideration of its position regarding the Barco concession. On Feb. 3, 1926, the Colombian government declared the concession forfeited and declared it cancelled anew by decree in August, 1928. The concession was held by Colombian Petroleum Co., in which Gulf Oil Corp. holds 75 per cent stock interest and Carib Syndicate 25 per cent.

Carib Syndicate, as owner of 550,000 shares of Colon Oil Corp. stock, has in its treasury one share of Colon stock for each outstanding share of Carib stock.

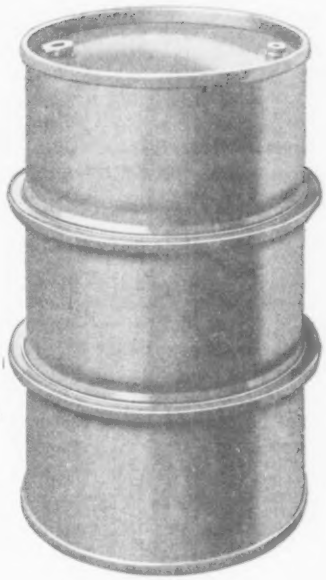
Colon's development work was financed July 1 with an issue of $10,000,000 10-year 6 per cent convertible debentures which have just been listed on the New York Stock Exchange.

Texon Proposes Change In Capital Structure

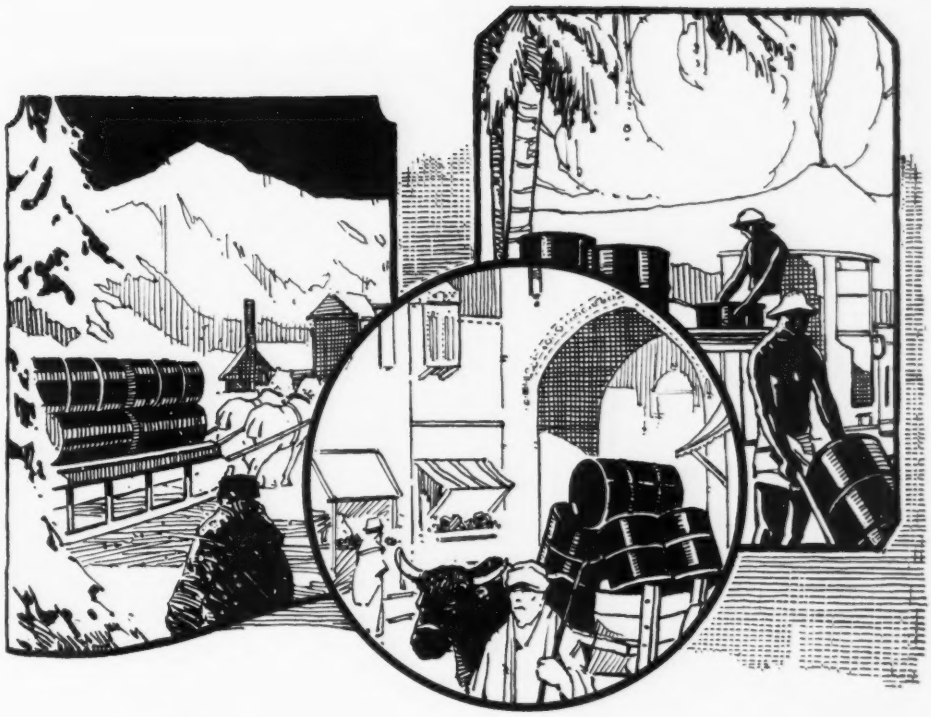
NEW YORK, Oct. 13.—Special meeting of stockholders of the Texon Oil & Land Co. will be held Nov. 27 in Wilmington, Del., to vote on proposal to change capital structure from 10,000,000 $1 par shares to 2,000,000 no par shares. It is planned to issue one new share for five of the old.

The company has outstanding 4,496,299 shares.

Pan American Petroleum & Transport Co.—Frederic Ewing has resigned as vice-president and general sales manager.



Serial No. 3055
I. C. C. Barrel



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MANUFACTURERS OF STEEL BARRELS; WIZARD OIL, GREASE, KEROSENE AND ALCOHOL EQUIPMENT

Transactions in Oil Shares on New York Stock Exchange

1927 High	1927 Low	1928 High	1928 Low	Listed Capital	Par Value	Stocks	Div. Rate	Last Paid	Transactions Week Ended Oct. 13 Sales	First	High	Low	Last	Change
37⅞	27⅝	38	27⅛	(sh) 922,075	N.P.	Amerada Corp.	50cQ	July 31, 28	17,600	32¼	33½	31¼	32½	0
82½	35¼	85	51¼	(sh) 209,180	N.P.	American Republics Corp.	....	....	5,400	68¾	71	67⅝	68¼	— 3
50¼	35	53¼	37½	$56,000,000	$ 25	Associated Oil.	50cQ	Sept. 29, 28	140	49⅝	49⅝	48	49⅝	+ ⅝
131⅜	104	194⅝	95¾	50,000,000	100	Atlantic Refining.	$1Q	Sept. 15, 28	19,800	183½	186¼	178¾	184	+ 2⅞
119	115½	118¼	114½	20,000,000	100	do pfd.	$1.75Q	Aug. 1, 28	50	117¾	117¾	116¾	117¾	+ 1¼
35½	20¾	41½	20⅛	30,971,225	25	Barnsdall Corp. A.	....	Feb. 6, 28	342,500	40¾	*41½	36½	38⅝	— 1⅜
32½	20½	41	22	581,850	25	do B.	....	Feb. 6, 28	700	39	*41	39	41	+ 1
18¼	14	20⅞	12¼	946,518	N.P.	Beacon Oil.	....	....	212,100	18⅞	*20⅞	18¾	20⅞	+ 2⅛
32⅞	20	32¾	24	51,524,150	25	California Petroleum.	25cQ	Oct. 1, 28	....	....	....	....	....	....
96¾	65	94⅜	70	20,980,400	100	General Asphalt.	....	....	14,300	74½	75	70¼	70½	— 2
144⅞	107¼	141½	111	6,662,200	100	do pfd.	$1.25Q	Sept. 1, 28	400	113¼	113½	113	113½	+ ½
175¾	60⅛	167	127	25,000,000	100	Houston Oil.	....	....	10,200	137½	144⅞	137½	139⅞	+ 3⅜
32¾	17⅝	32¾	21¾	(sh) 659,000	N.P.	Independent Oil & Gas.	25cQ	July 31, 28	8,300	29⅞	29⅞	28⅝	29⅝	+ ⅛
12⅛	7⅝	39⅝	9	$3,582,670	$ 10	Indian Refining.	....	Dec. 15, 20	79,200	30⅛	34⅜	30¼	35⅜	+ 5⅜
12	7¼	37¼	8½	4,550,110	10	do ctfs.	....	....	17,000	28	31⅝	28	31⅝	+ 3½
112	99	250	101	2,296,400	100	do pfd.	....	Dec. 15, 21	100	165	165	165	165	0
37¾	20½	39⅛	27⅜	(sh) 3,992,234	N.P.	Lago Oil & Transport.	75cQ	Aug. 2, 28	1,500	32½	33¼	32½	33	— 2
18⅜	10	19¾	9⅜	(sh) 1,187,003	N.P.	Louisiana Oil Refining.	....	....	7,900	14¾	15⅛	14¾	15	0
97	85¼	101	78	$4,000,000	$100	do pfd.	$1⅜Q	Aug. 15, 28	160	90	90	89½	89½	— ½
22⅝	12	25⅛	12½	(sh) 330,000	N.P.	Maracaibo Oil.	....	....	1,000	18	18	17	17	— 1
58⅓	31	44⅜	33	(sh) 2,316,851	N.P.	Marland Oil Co.	....	Mar. 31, 27	34,300	37⅝	40	37½	39⅞	+ 2
320	200	360	250	$45,942,800	$100	Mexican Petroleum.	$3Q	Oct. 20, 28	.....	....	....	....	....	.....
...	...	...	...	12,000,000	100	do pfd.	$2Q	Oct. 20, 28	....	....	....	....	....	.....
9¼	3	39	4⅝	(sh) 995,500	N.P.	Mexican Seaboard.	....	Nov. 15, 24	163,800	31⅞	34⅞	31⅝	34½	+ 3¾
39⅝	25⅛	37⅜	25⅛	(sh) 1,857,461	N.P.	Mid-Continent.	....	Aug. 1, 27	47,600	35⅞	36¼	35	35⅞	— ⅛
105	97	115⅛	103¼	$6,718,000	$100	do pfd.	$1.75Q	Sept. 1, 28	.....	....	....	....	....	.....
3¾	1⅝	7⅛	2⅜	24,060,470	10	Middle States.	....	July 1, 23	13,600	5¾	5⅞	5½	5½	— ¼
2¾	1⅛	5⅞	1½	5,739,750	10	do ctfs.	....	....	3,200	4⅛	4⅛	3¾	4	0
1⅞	1	2¼	1	(sh) 3,500,000	N.P.	Pacific Oil.	....	....	23,600	1¼	1¼	†1	1⅛	— ⅛
65⅞	40¼	53¾	38¼	$50,000,000	$ 50	Pan American P. & T.	....	Oct. 20, 27	2,700	46	46½	45	45	— 1⅛
66⅜	40¼	54⅝	37¾	121,100,000	50	do B.	....	Oct. 20, 27	28,300	48¾	49	47¼	48	— ½
37⅞	16¾	28⅛	15½	(sh) 400,000	N.P.	Pan American.	....	Jan. 30, 27	2,800	17¼	17⅝	17¼	17½	+ ¼
18⅞	8	21¾	11½	(sh) 199,370	N.P.	Panhandle P. & R.	....	....	5,200	13½	14	12½	13⅝	0
83	54	106¼	70	$2,935,200	$100	do pfd.	....	July 2, 23	100	79	79	79	79	— 2
60¼	36¼	45	35¼	(sh) 2,406,796	N.P.	Phillips Petroleum.	37½cQ	Oct. 1, 28	15,200	42⅜	42⅜	41	42⅛	— ⅛
1¾	½	4¼	½	$29,622,925	$ 25	Pierce Oil.	....	....	10,700	3¾	3¾	3	3¼	— ¼
24	13½	50	16¼	15,000,000	100	do pfd.	....	Feb. 1, 22	8,500	46½	46½	41¾	42⅞	— 5⅜
5⅜	2½	6⅝	3½	(sh) 2,500,000	N.P.	Pierce Petroleum.	....	....	9,300	6	6	5⅜	5½	— ⅜
33⅞	16⅜	26⅞	16	$37,450,850	$ 50	Producers & Refiners.	....	Sept. 15, 23	2,200	23¾	24¾	23	23	— ⅝
50	36⅞	46⅞	41	2,845,350	50	do pfd.	....	May 1, 25	10	45	45	45	45	0
33½	25	27½	19	75,952,250	25	Pure Oil Co.	12½cQ	Sept. 1, 28	17,100	26	26	25¼	25⅝	— ¼
115½	111⅛	115	108	13,000,000	100	do 8% pfd.	$2Q	Oct. 1, 28	310	115	115	112½	112½	0
28⅝	25⅝	51⅞	24	$43,764,450	$ 25	Richfield Oil.	‡25cQ	Aug. 15, 28	29,900	49⅜	50	47⅜	49	— ⅛
54½	44¼	61¼	44⅝	(sh) 585,293	13.40	Royal Dutch N. Y. shares.	$1.879	Aug. 3, 28	14,500	60	*61¼	60	61¼	+ 1½
47⅞	41⅜	54¼	40⅝	(sh) 67,300	£2	Shell Transport & T.	$1.455	July 23, 28	200	54¼	*54¼	54¼	54¼	+ ¾
31⅜	24⅝	31	23¼	(sh) 10,000,000	N.P.	Shell Union Oil.	35cQ	Sept. 30, 28	18,300	28	29	27⅞	28⅞	+ ¾
26⅜	14¼	24⅜	18⅛	$7,208,080	$ 10	Simms Petroleum.	....	Apr. 1, 27	2,400	21¾	22¼	21⅜	22	— ¼
22⅜	15	32⅜	17⅜	(sh) 4,503,031	N.P.	Sinclair Consolidated.	....	May 31, 24	108,000	28¼	29¼	27⅝	28¼	+ ⅛
104½	97	109½	102½	$16,310,100	$100	do pfd.	$2Q	Aug. 15, 28	700	108	108	107¾	108	0
37⅝	24⅛	36¾	25	27,396,590	25	Skelly Oil Co.	50cQ	Sept. 15, 28	13,400	35½	36	34⅝	35¼	0
60¾	50⅜	63⅞	53	(sh) 13,016,434	N.P.	S. O. California.	62½cQ	Sept. 15, 28	26,200	60½	61⅜	59¾	60¾	+ ⅝
41⅜	35⅛	49	37⅜	$610,195,375	$ 25	S. O. New Jersey.	‡25cQ	Sept. 15, 28	37,100	45½	45¾	45⅛	45¾	+ ⅝
34⅛	29¾	41⅛	28⅜	431,973,275	25	S. O. New York.	40cQ	Sept. 15, 28	39,500	35¼	35½	34¾	35⅛	+ ⅛
34⅞	30	58	31½	(sh) 1,206,463	N.P.	Sun Oil.	25cQ	Sept. 15, 28	4,400	55	*58	54½	55½	+ 1½
101⅜	99	109½	100	$5,000,000	$100	do pfd.	$1.50Q	Sept. 1, 28	3,000	104	104	104	104	— 1
6½	3⅛	9½	2⅜	(sh) 1,186,078	N.P.	Superior Oil Corp	....	Dec. 20, 20	32,300	8	8	7½	8	0
58	45	72⅞	50	$210,577,050	$ 25	The Texas Corp.	75cQ	Oct. 1, 28	56,200	66⅝	68⅝	66⅝	67½	+ ⅝
18⅞	12	17½	12½	8,380,340	10	Texas Pacific Coal & Oil.	....	Jan. 3, 28	27,900	16	16¼	15⅛	15⅞	— ⅜
29¼	19	36	19⅝	(sh) 2,168,498	N.P.	Tide Water Oil Co.	20cQ	Sept. 29, 28	5,200	35	*36	34	35	0
90¼	85	94⅛	87	$20,705,200	$100	do 5½% pfd.	$1.25Q	Aug. 15, 28	.....	....	....	....	....	.....
19¼	15¾	24¾	14¾	(sh) 4,824,766	N.P.	Tide Water Associated.	....	Aug. 1, 27	32,600	22⅞	23	21⅜	22½	— ¼
90¾	85	90¾	82½	$72,745,958	$100	do pfd.	$1.50Q	Oct. 1, 28	300	88	88½	88	88½	+ ¼
10¾	3¾	10⅛	7	(sh) 3,842,029	N.P.	Transcontinental Oil.	....	....	40,600	7¾	8½	7¾	8½	+ ¾
56½	39⅜	57	42¾	$40,841,100	$ 25	Union Oil of California.	50cQ	Aug. 10, 28	26,000	50	52⅞	49	51¾	+ 2¼
127½	94	128⅛	110	31,061,200	100	Union Tank Car Co.	$1.25Q	Sept. 1, 28	100	110	110	110	110	— 1
34½	24½	42¾	26	(sh) 357,197	N.P.	Warner Quinlan.	50cQ	Oct. 1, 28	53,000	39	42½	39	40⅛	+ 1⅛
27½	20	29½	20⅛	(sh) 490,000	N.P.	White Eagle Oil & Refining.	50cQ	Oct. 20, 28	9,800	27¾	29¼	27⅜	28½	+ 1½

•New High †New Low ††Ex-dividends ‡Also extras s-Stock Total Sales 3,687,100

Pittsburgh Stock Exchange

1927 High	1927 Low	1928 High	1928 Low	Par Value	Stocks	Transactions Week Ended Oct. 11 Sales	First	High	Low	Last	Change
....	....	4	2⅛	N.P.	Ark. Nat. Gas (new).	21,220	3½	3⅝	3¼	3½	— ⅛
....	....	7½	6¾	N.P.	do pfd.	5,964	7⅛	7¼	7⅛	7⅛	0
98¾	80⅞	120¼	90¾	100	Colombia Gas.	.....	....	....	....	....	.....
107⅞	100	124	107	100	do pfd.	.....	....	....	....	....	.....
15	7⅜	10	6⅞	10	Devonian Oil.	235	7½	7½	7	7¼	— ¼
....	....	15	9	10	Dixie Gas & Util.	.....	....	....	....	....	.....
....	....	95	85	100	do pfd.	.....	....	....	....	....	.....
117¾	115	116	115	100	Duquesne Light pfd.	.....	....	....	....	....	.....
....	....	85	80½	100	Fayette County Gas.	.....	....	....	....	....	.....
12¼	6	22	12	N.P.	Houston Gulf Gas.	.....	....	....	....	....	.....
59¼	37¼	58⅜	48⅝	$ 25	Lone Star Gas.	2,175	57	58	57	57½	+ ½
....	....	38	36	25	Petroleum Exploration	.....	....	....	....	....	.....
....	....	.50	.50	....	Phoenix Oil pfd.	.....	....	....	....	....	.....
3¾	3	4	3	5	Pittsburgh Oil & Gas.	.....	....	....	....	....	.....
8	5¾	7¼	6	10	Salt Creek Cons.	.....	....	....	....	....	.....
26½	17	22	16¾	10	Tidal Osage.	.....	....	....	....	....	.....
43	33	33⅝	30½	N.P.	Waverly Oil Wks. A	.....	....	....	....	....	.....
....	....	19	17	$ 25	Wiser Oil.	.....	....	....	....	....	.....

•New high record †New low.

Pittsburgh Curb Exchange

1927 High	1927 Low	1928 High	1928 Low	Par Value	Stocks	Transactions Week Ended Oct. 11 Sales	First	High	Low	Last	Change
....	....	....	....	....	Ark. Gas (old).	1,000	10¼	10¼	10¼	10¼	0
95	88	132	120	25	Gulf Oil.	.....	....	....	....	....	.....
....	....	115	115	....	Houston Gulf Gas pfd.	.....	....	....	....	....	.....
10¾	5¼	9	5½	25	Leonard Oil & Dev.	.....	....	....	....	....	.....
2¼	1¼	....	....	5	Pittsburgh Oil Dev.	.....	....	....	....	....	.....
31	19	26½	16¾	5	Plymouth Oil.	7,009	26½	†26½	24	24⅝	— ¼
6	5	4¾	4	5	States Oil.	.....	....	....	....	....	.....
3⅛	1⅜	....	2¼	1	Texon Oil & Land.	175	3⅞	4	3⅞	4	+ ⅛
23¾	18	18	15	10	Tidal Osage Non-vgt.	.....	....	....	....	....	.....

•New High †New Low x Ex Dividend

Oil Dividends

	Amount	Payable	Stock of Record
Mid-Cont. Pet. pfd. q.	$1.75	Dec. 1	Nov. 15
North Central Texas q.	15c	Dec. 1	Nov. 10
Sinclair Cons. pfd. q.	$2	Nov. 15	Nov. 1
Union Oil q.	50c	Nov. 10	Oct. 18

Oil Company Earnings

Half Year	1928	1927
Darby Petroleum	*$783,781	*$348,470
Pan Amer. P. & T. Co.	†5,209,841	†12,438,804
Nine Months	**1928**	**1927**
Union Oil Co.	8,550,000	8,500,000

*Before depreciation and depletion.
†Before federal taxes.

Colon Oil Corp.—Interim certificates for $10,000,000 10-year convertible 6 per cent debentures, due July 1, 1938, listed on New York Stock Exchange. Debentures are to be admitted to list on notice of issuance.

Transcontinental Oil Co.—$12,000,000 first mortgage 10-year 6½ per cent sinking fund bonds, due July 1, 1938, listed on New York Stock Exchange.

Warner Quinlan Expected To Retire Funded Debt

NEW YORK, Oct. 13.—Warner Quinlan Co. is expected to call for redemption Nov. 14 the $2,425,000 outstanding 6 per cent convertible debentures at 105 and interest. Redemption will eliminate the company's funded debt. No new financing is to be undertaken in connection with the redemption.

It is expected that many holders will avail themselves of the conversion privilege which is 27 shares of stock and $5.59 for each $1000 debentures. Figuring the debentures at 105 this is a price of $38.67 a share for the stock which closed at $40 a share Oct. 11 on the New York Exchange.

It is officially estimated third quarter earnings will be equivalent to approximately $1.45 a share on the common, which would bring nine months' earnings to around $3.72 a share. In the first six months of this year the company and its subsidiaries reported net profit of $707,310 after depreciation, depletion, federal taxes, etc., equivalent after preferred dividends to $2.27 a share earned on 285,613 average number of common shares outstanding during the period. In the first half of 1927 net profit was $365,313, or $1.66 a share on 209,713 average number of common shares outstanding.

Oil production on the company's properties in Texas and Mexico is averaging about 8000 barrels daily. Two new pipe stills are being installed at the company's refinery which will more than double present capacity and increase refining capacity to over 12,000 barrels a day. These units will be completed and in operation about Nov. 15.

Union's Production Falls But Sales Increase

CLEVELAND, Oct. 13.—The Union Oil Co. of California in reporting a $50,000 increase in net earnings in the first nine months of 1928 over earnings in the corresponding months of 1927, announced that its production of crude and natural gasoline this year amounted to 10,350,000 barrels, subject to royalties, or 1,400,000 barrels less than was produced in the first nine months last year.

Sales in the nine months this year amounted to $62,900,000, a gain of $3,550,000 over sales in the corresponding time last year.

Current assets Sept. 30 were approximately $57,000,000 and current liabilities $11,000,000.

Sept. 30 the company held in storage 25,700,000 barrels of all oils, an increase of 3,900,000 barrels in the nine months.

THE OIL INDUSTRY EXCHANGE

Positions Wanted

TRAFFIC MANAGER AND GENERAL OFFICE, experienced in I. C. C. and A R A rulings, 14 years industrial and seven years railroad. Age 38, married, best references. Address Box 174.

REFINERY SUPERINTENDENT, eighteen years experience, thoroughly familiar with designing, construction and operation of modern skimming, lubricating and cracking plants. Address Box 129.

SALESMAN twelve years experience, wants good line of lubricating oil or other line; willing to travel New England States on commission basis with drawing account. Address Box 183.

EXPERIENCED LUBRICATING OIL AND GASOLINE SALESMAN, 29, well acquainted with jobbing trade in Missouri, Kansas and Iowa desires connection with refiner or marketer. Prefer tank car sales. Excellent references. Married. Address Box 187.

POSITION WANTED, ABOUT JANUARY 1ST, 1929. LUBRICATING ENGINEER having had 15 years practical experience, 5 years selling Lubricants, in Tank Car and Bulk delivery. Thoroughly familiar with recommendations for Lubrication of and adjusting trouble in Industrial and Power Plants. Technical education. Married. Employed at present as Supervisor. Address Box 189.

Situations Open

SALESMAN WANTED

Good territory open with excellent opportunity for the salesman who knows the oil marketing trade. Represent long established manufacturer selling car hoists, air compressors, pumps, etc. Answer fully, giving age, experience, present and past connections.

Address Box 193

PREMIUM GASOLINE SALESMAN WANTED

Must have extensive experience retail selling of premium motor fuel. Must be able to sell and also organize others to sell premium fuel of recognized excellence.

Address Box 191

ROAD OIL SALESMAN WANTED

Must have good technical background and preferably actual experience at road building, also actual sales record. Middle West experience preferred.

Address Box 192

DRAFTSMEN

Refinery draftsmen experienced in general plant layout, topping plant, cracking plant, boiler house, pumphouse piping design, etc. Give experience, age and salary wanted. Apply drawer D-15, St. Louis, Mo.

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Patent Attorneys

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Standard Oil Stocks on New York Curb

1927 High	1927 Low	1928 High	1928 Low	Outstanding Capital	Par Value	Stocks	Div. Rate	Last Paid	Transactions Week Ended Oct. 13 Sales	First	High	Low	Last	Change
21⅜	17⅞	22¾	17	£ 4,126,460	£ 1	Anglo-American Oil	24.4c	June 6, 28	600	18¾	19	18¾	19	0
21½	17⅝	20½	16¾	.....	£ 1	do cts. non-voting	.....	.....	600	18¾	18¾	18¾	18¾	— 1/8
3¾	¾	5	1¼	(sh) 500,000	N.P.	Atlantic Lobos	.....	.....	3,800	3⅜	4¼	3⅜	3⅜	— 1/4
6⅛	2½	9¾	3¼	$ 10,000,000	$ 50	do pfd	.....	.....	300	8½	9	8¼	8¼	— ⅜
69	50	56	48	1,000,000	25	Borne Scrymser	‡$1S.A.	Oct. 15, 28	50	48	48	†48	48	— 4
60	45	76	58	10,000,000	50	Buckeye Pipe Line	‡$1Q	Sept. 15, 28	400	67½	67¾	67½	67¾	+ ¼
126	76½	161	117¼	3,000,000	25	Chesebrough Mfg.	‡$1Q	Sept. 29 28	200	140⅛	140⅛	140	140	0
22⅝	16¼	23	16	36,123,350	10	Continental Oil	.....	Dec. 15, 27	7,700	17½	17⅝	16¾	17¼	— ¼
137	89	114	88	1,500,000	50	Cumberland Pipe Line	$15	Sept. 15, 28	.....	.....	.....	.....	.....	.....
68½	47	88	64½	5,000,000	100	Eureka Pipe Line	$1Q	Aug. 1, 28	.....	.....	.....	.....	.....	.....
13½	3⅛	13	5	16,000,000	100	Galena Signal Oil	.....	June 30, 25	200	7	7	8	8	+ 1¼
59¾	23	87⅛	27	4,000,000	100	do new pfd	.....	June 30, 26	120	82	83	80¼	83	0
60½	35½	89¾	35	2,000,000	100	do old pfd	.....	June 30, 26	20	83	83	78¼	78¼	— 4⅜
68⅛	54	84⅞	60	73,685,700	25	Humble Oil & Refining	‡30cQ	Oct. 1, 28	14,800	80⅞	80⅞	80	80⅛	— ⅜
182	123¾	245	176½	20,000,000	100	Illinois Pipe Line	$6S.A.	June 15, 28	550	219	221	210	221	— 3¼
64¾	37¾	82	56¾	(sh) 6,591,458	N.P.	Imperial of Canada	‡25cQ	Sept. 1, 28	17,800	78	81¾	77¼	81½	+ 3½
94½	61	91⅞	74⅞	$ 5,000,000	$ 50	Indiana Pipe Line	‡$1Q	Aug. 15, 28	1,800	88	*91⅞	88	91	+ 2⅛
39	28¼	45¼	35	(sh) 7,123,544	N.P.	International Petroleum	25c	June 30, 28	42,700	38	38¾	37½	38⅜	+ ⅛
24	13¼	32⅜	19⅜	6,363,350	12.50	National Transit Co	‡25cQ	Sept. 15, 28	6,200	24¾	24¾	24⅛	24¾	0
44½	31¼	65	37½	5,000,000	100	New York Transit	.....	July 15, 26	300	65	*65	64½	64½	+ ⅜
100	70	125	56½	2,000,000	50	Northern Pipe Line	(a)$3S.A.	July 2, 28	2,200	63	63	62	63	+ 1
67⅞	52	68¼	58	60,000,000	25	Ohio Oil Co	50cQ	Sept. 15, 28	1,000	61¼	61¼	60⅜	61	— ½
39	12	84	28	10,000,000	25	Penn Mex. Fuel	$1.25	May 31, 28	800	43⅛	44	42⅞	42⅞	+ ⅜
55⅜	45⅜	56	46	60,479,000	25	Prairie Oil & Gas	.....	Aug. 31, 27	4,600	47	47⅜	46½	46⅞	— ½
190	132	223	172	81,000,000	100	Prairie Pipe Line	$3.50Q	July 31, 28	700	186	186	184	184	— 2¼
201⅛	175⅛	186	167	4,000,000	100	Solar Refining	$5S.A.	June 20, 28	.....	.....	.....	.....	.....	.....
27¾	15⅜	35⅞	12	1,000,000	10	Southern Pipe Line	$2	Dec. 1, 27	.....	.....	.....	.....	.....	.....
41⅜	35	68	36¾	20,000,000	25	South Penn Oil	‡50cQ	Sept. 29, 28	28,300	63⅞	*68	63	66¾	+ 3⅜
83	55½	100¾	70	3,500,000	100	South West Pa. Pipe Lines	$1Q	Oct. 1, 28	100	85	85	84½	85	+ 3½
81½	64⅝	83⅝	70⅛	230,788,513	25	S. O. Indiana	‡62½cQ	Sept. 15, 28	12,600	76¼	77¼	76⅛	77	+ ⅝
20½	14⅝	27¾	15	8,000,000	25	S. O. Kansas	.....	June 16, 24	300	20⅝	20⅝	20⅜	20¾	— ⅛
130	111½	140	122¼	17,103,011	25	S. O. Kentucky	$1Q	Sept. 29, 28	4,400	133¾	132⅛	138	137⅞	+ 4⅜
49⅛	40	45⅞	39¾	4,601,100	25	S. O. Nebraska	63cQ	Sept. 20, 28	100	44	44	44	44	— ¼
87¼	72	95	71	14,000,000	25	S. O. Ohio	62½cQ	Oct. 1, 28	500	91¼	92½	91	91½	— ½
122	117¼	125	116	7,000,000	100	do pfd	$1.75Q	Sept. 1, 28	20	118¾	118¾	118¾	118¾	+ ¾
21	14½	26	16	861,466	25	Swan Finch Co	30c	June 30, 28	.....	.....	.....	.....	.....	.....
....	....	87⅛	72	126,154,100	25	Vacuum Oil	75cQ	Sept. 20, 28	5,500	79¾	80½	79⅛	79¾	+ ⅛

*New high †New low xEx dividend ‡Also extras. (a)$50 Special Sept. 1, 1928.

Independent Oils on New York Curb

1927 High	1927 Low	1928 High	1928 Low	Par Value	Stocks	Transactions Week Ended Oct. 13 Sales	First	High	Low	Last	Change
2⅛	.55	1⅛	.65	$ 5	Amer. Con. Oilfields	18,900	.70	.74	.68	.74	+ .4
7½	2¾	6⅝	3¼	N.P.	Amer. Maracaibo	2,300	4¾	4⅞	4½	4⅝	— ⅛
2¾	1	4⅛	2¼	$ 10	Argo Oil	100	2½	2½	2½	2½	— ¼
9¾	6¾	10¼	7¾	10	Arkansas Nat. Gas						
.....	.....	16¼	3⅞	.....	Barnsdall deb. war	161,600	15½	*16¼	13⅜	15¼	0
40	20½	42	32¾	N.P.	British American						
28¼	15½	23⅞	12½	25c	Carib Syndicate N	600	13½	14	13	14	+ ¼
.....	.....	.....	.....	.....	do ctfs. of dep						
58¾	40¼	72½	54	$ 20	Cities Service	28,500	71¾	71⅞	70½	71	— 1
95⅛	87	103½	94½	100	do pfd	800	100¼	100⅝	100⅛	100⅝	+ ⅜
8¼	7⅛	9⅝	8⅛	10	do pfd. B	200	9⅜	9⅜	9⅜	9⅜	0
29¼	22½	94	28¼	10	do banker's shares						
3⅛	1⅛	2¼	1⅛	1	Colombia Syndicate	3,700	1⅛	1⅛	1⅛	1⅛	— ⅛
9⅜	6⅛	15⅜	6¾	10	Consolidated Royal	600	6½	6⅝	6½	6½	— 8¾
14½	9½	17½	10	N.P.	Creole Syndicate	13,400	12⅝	12⅝	12	12¼	— ¼
3	.50	3¼	.76	N.P.	Crown Central	1,800	1½	1½	1½	1½	0
12	4	30¼	8½	N.P.	Darby Petroleum	22,500	29½	29½	26½	27⅛	— 2¼
11¼	4	13⅜	7⅛	.....	do trust ctfs						
2¼	.74	22	1	N.P.	Derby Oil & Refining	400	1	1⅛	1	1¾	+ ⅜
16⅜	4	15⅜	7½	N.P.	do pfd	100	13	13	13	13	— 1
3¾	1	2	1	N.P.	Gibson Oil	.....	.....	.....	.....	.....	.....
2	.40	.53	.15	N.P.	Gilliland ctfs	.....	.....	.....	.....	.....	.....
118	86¼	148½	101¾	$ 25	Gulf Oil Corp	4,500	123⅛	124½	121¼	121¼	— 3½
2⅛	.80	7¼	1	10	Intercontinent Pet	29,800	2	2⅛	1⅝	1⅞	— ¼
2¼	1⅛	3	1¼	N.P.	Kirby Petroleum	13,200	2	2⅞	2	2⅞	+ 1⅛
10⅞	5⅜	9¾	5⅞	N.P.	Leonard Oil & Dev.	3,500	5⅜	5⅞	5¼	5½	— ½
27½	20	41	20	N.P.	Lion Oil & Refg.	28,500	39⅞	40⅞	38	40⅞	+ 1½
59⅛	37	59⅞	48⅝	$ 25	Lone Star Gas	1,900	57¾	58	57	58	0
2¼	.80	1⅞	.54	1	Magdalena Synd	19,000	75	76	71	76	— 37
21¼	20⅞	22¼	22¼	N.P.	Manhattan Oil						
52	12	45	34½	N.P.	Margay Oil	100	34½	34½	†34½	34½	— 4¼
3	1⅛	40½	40½	$ 10	Mexican-Panuco						
12⅛	5	8	4	N.P.	Mexico-Ohio Oil						
1⅝	1	1⅛	.76	$ 1	Mountain & Gulf	2,300	84	84	81	81	— 3
29¼	22¾	28⅜	21½	10	Mountain Producers	500	22⅜	22½	22⅛	22⅜	— ⅛
5⅞	4⅜	5⅜	4¼	5	New Bradford	400	4½	4½	4½	4½	4½
6¼	4	5½	3	10	New England Fuel	200	3⅝	3⅝	3⅝	3⅝	— ¼
16	9¼	11⅜	7⅛	1	New Mex. & Ariz	1,400	8¾	8¾	8	8¾	0
13¼	9	15⅜	11⅛	25	New York Oil						
.....	.....	40	39⅛	.....	North Amer. Oil Cons.						
12¾	9½	13¼	10¾	N.P.	North Cent. Texas	300	11¼	11¼	11	11	— ½
23⅛	21¼	.....	.....	.....	Okla. Nat. Gas ctfs.						
9⅛	3¼	6	2¾	N.P.	Pandem	1,700	2½	2½	2½	2½	0
12⅛	7	15⅜	8½	N.P.	Panapec Oil	4,800	13½	13⅜	12⅝	13	— ½
9	7⅛	20	10⅝	$ 25	Paragon Refg.						
.37	.25	9	4	N.P.	Peer Oil Corp						
13⅜	5¼	7¾	5¼	10	Pennok Oil						
.....	.....	4½	3⅜	5	Pittsburgh Oil & Gas						
24¼	7	14½	8	25	Red Bank Oil	100	9⅛	9⅛	9⅛	9⅛	— 2⅜
15½	3⅛	13	4⅜	N.P.	Reiter-Foster	6,500	9¼	9⅜	8¾	9¼	+ ⅛
28⅝	15	31⅜	18	$ 25	Richfield Oil pfd						
.....	.....	23	7½	.....	do warrants						
7	4½	9⅛	4⅝	N.P.	Ryan Consolidated	1,300	5¼	6	5¼	6	+ ¼
8	5¼	7¾	5⅝	$ 10	Salt Creek Cons	500	5⅞	5⅞	5⅞	6	+ ⅜
35⅛	27½	35	23½	10	Salt Creek Prod	2,300	26½	26⅞	26¼	26⅞	0
7	1¼	3½	1	5	Savoy Oil	6,700	1¾	1¾	1¾	1¾	0
.....	.....	4⅝	3	1	Texon Oil & Land	171,800	3⅛	4¼	3⅛	4	+ ⅜
26½	17	22⅞	13	10	Tidal Osage	200	17⅛	17⅞	17	17	— ⅛
23¾	15	21¾	13⅛	10	do non-voting	500	16⅝	16⅞	16½	16⅞	+ ¼
92	63⅛	87	75	100	Transcontinental pfd.	400	75	78	75	78	— 2⅛
23¼	7	53½	18	10	Venezuela-Mexico						
7⅛	4¼	8⅛	4⅜	5	Venezuelan Petrol	30,200	7⅝	7⅝	7	7	— ⅝
32¾	19½	25	15½	N.P.	Wilcox Oil & Gas	900	17½	18	17½	18	+ ½
8	4½	8¼	4⅞	$ 1	Woodley Petroleum	300	5½	5½	5½	5½	0
6	1¾	8⅝	2⅛	25	Y Oil & Gas (new)	1,000	5	5	4⅛	4⅛	— ¾

*New High †New Low xEx Dividend

New York Curb Bonds

Week Ending Oct. 12

	High	Low	Last	Ch'ge
Beacon Oil 6s '36	110¾	105⅛	109	+4
Cities Serv. 5s '66	94¼	93¾	94	— ⅛
Cities Serv. 6s '66	104¼	103½	103½	0
Cities Serv. G 5½s '42	93⅝	93⅜	93½	+ ⅛
Empire O & R 5½s '42	92¾	92½	92¾	+ ¼
Galena Oil 7s '30	100⅝	100⅝	100⅝	0
Gulf Oil 5s '37	100⅝	100¼	100¼	— ⅜
Gulf Oil 5s '47	100⅝	100¼	100¼	— ¼
Independent Oil 6s '39	103⅞	102⅝	103⅞	+ ¾
Richfield Oil 6s '41	135	135	135	— ½
Sun Oil 5½s '39	101	100½	101	+ ½
Warner Quinlan 6s '42	114½	108¼	109	—1⅛

New York Bonds

Week Ending Oct. 12

	High	Low	Last	Ch'ge
Assoc. Oil gold 6s	102⅞	102¾	102¾	— ⅛
Atlantic Refg. deb. 5s	101⅝	101⅝	101⅝	+ ⅛
Barnsdall Corp. 6s	127¼	122	126⅛	+3⅝
Barnsdall Corp. 8s ex-war.	97	93½	96⅜	+3⅜
Cal. Pet. 5s	101¾	101	101¼	— ½
Cal. Pet. 5½s	103	102¾	103	—2⅞
General Asphalt 6s	107¾	107	107	— ¼
General Pet. 5s	101	100½	101	+ ½
Humble Oil & Refg. 5s	100	99⅞	100	0
Mid. Cont. Pet. 6½s	105¼	105	105¼	+ ¼
Pan Amer. P & T 7s	104⅞	104½	104½	— ¼
Pan Amer. P & T 6s	103¼	102½	103	— ¼
Pan Amer. P & T 6s	94⅜	94½	94½	— ¼
Prod. & Refg. 8s	111	110¾	110¾	0
Pure Oil 5½s	99½	99⅜	99⅜	0
Shell Union Oil 5s	98	97½	98	+ ⅛
Simms Pet. 6s	100⅛	100	100	— ½
Sinclair Con. Oil 7s	102⅛	101⅞	102	0
Sinclair Con. Oil 6½s	100¼	99¾	100	0
Sinclair Con. Oil 6s D	99⅛	99	99	— ⅛
Sinclair Crude Oil 5½s	97⅞	97½	97⅞	+ ⅜
Sinclair Pipeline	94	93⅞	94	— ¼
Skelly Oil 5½s	93⅞	93½	93⅞	0
S. O. N. Y. 4½s	96½	96	96¼	+ ⅛
S. O. N. J. 5½s	102⅞	102¾	102¾	— ⅛
White Eagle Oil 5½s	99	97½	99	+ ⅝

Beacon Oil Co.—Newspaper reports are that Beacon will show net earnings of $800,000 in third quarter compared with $147,000 in the third quarter of 1927. In the second quarter this year Beacon netted $507,065 and in the first quarter it lost $408,920.

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Single Copies 10¢
Subscription rate $3.50 per yr. in U.S.A. and Mexico (U.S. money)
$4 in Canada
$5 in foreign countries
Trade Mark reg. U.S. Pat. Off.
Members of Audit Bureau of Circulations and Associated Business Papers, Inc

NATIONAL PETROLEUM NEWS

Branch Offices:
LOS ANGELES
Petroleum Securities Building
TULSA.
World Building
NEW YORK
342 Madison Avenue
HOUSTON
612 West Building
CHICAGO
35 Wacker Drive

Published by the National Petroleum Publishing Co. MAIN OFFICE · 1213 W. 3rd St., Cleveland, Ohio. Copyrighted 1928

Vol. XX Cleveland, Ohio, October 17, 1928 No. 42

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